POST-CONVENTION ISSUE June, 1949

THE FOUNDRY

wherever metals are cast...

NOW — MECHANIZED MATCH-PLATE MOULDING with the NEW

OSBORN ROTA-LIFT MOULDING MACHINES

JOLTS · ROLLS · SQUEEZES DRAWS · CLOSES

Patent No. 2,012,478
other patents pending

OSBORN

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue Cleveland, Ohio

from '28 to '48 ... increasing consumption of PURITE verifies foundrymen's approval

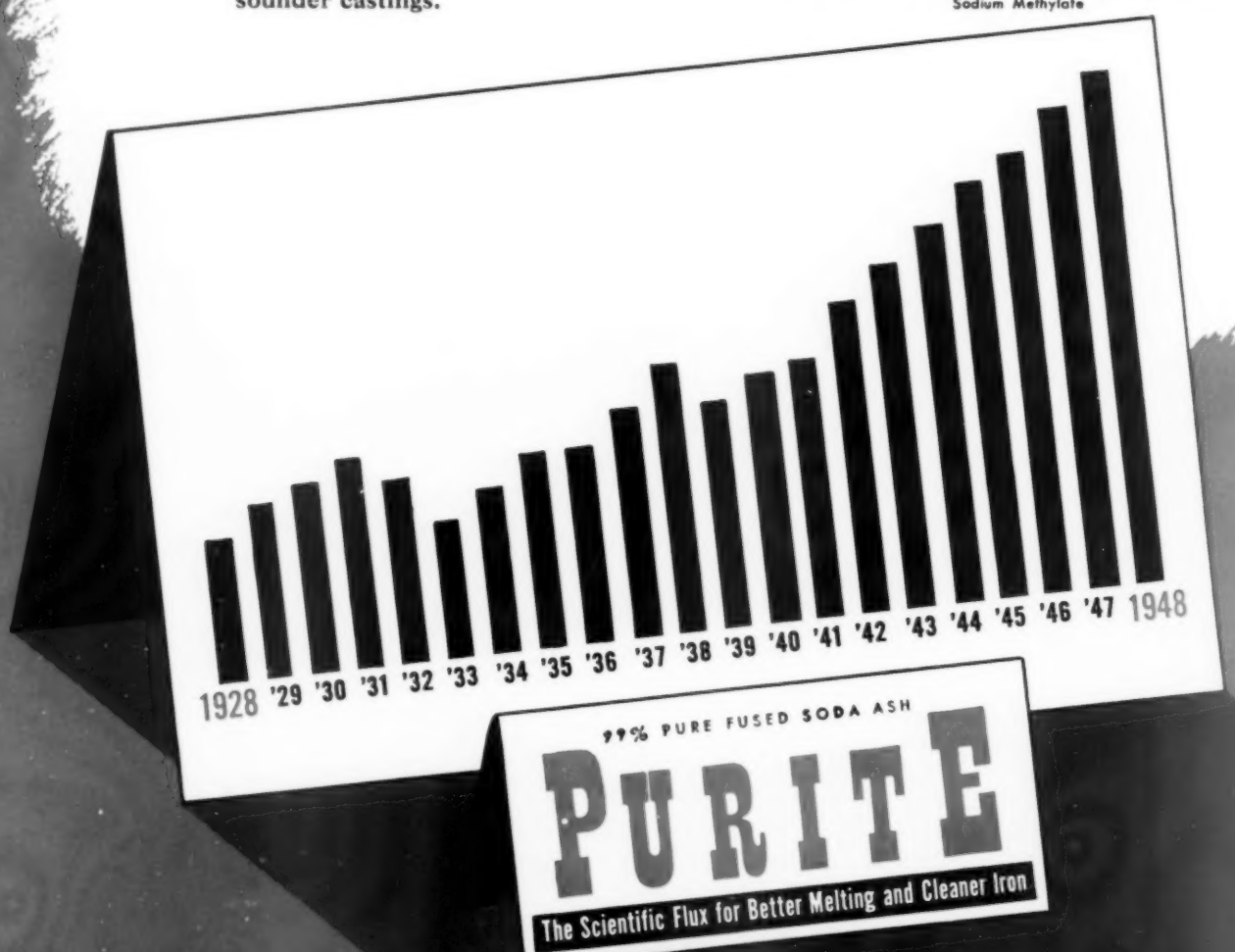
Purite's remarkable action in desulphurizing and refining iron in the ladle or in the cupola hearth—its effect on combustion—and its action in smoothing out cupola melting operations are the reasons behind the ever-increasing use of Purite by progressive foundrymen everywhere. Their stepped-up demand for this scientific flux is the best testimonial they can give.

In addition to removing sulphur, Purite purges molten metal of occluded gases, entrained oxide-silicates and other non-metallic impurities that may cause pinholes, gas pockets or other defects. Refining with Purite increases strength ...improves grain structure and machinability ... speeds production of cleaner, sounder castings.

In four principal casting centers in the North, South, East and Midwest the vast majority of foundries use Purite regularly. You'll want to know why so many foundries order and re-order Purite—so write for free factual information which tells how Purite helps them—and how it can help you in these competitive days. Mathieson Chemical Corporation, 60 East 42nd Street, New York 17, N. Y.

Mathieson
CHEMICALS

Purite (Fused Soda Ash) · Liquid Chlorine · Caustic Soda · Soda Ash
Bicarbonate of Soda · Ammonia, Anhydrous & Aqua · Sodium Chlorite
Products · Chlorine Dioxide · HTH Products · Dry Ice · Carbonic Gas
Sodium Methylate


1928 '29 '30 '31 '32 '33 '34 '35 '36 '37 '38 '39 '40 '41 '42 '43 '44 '45 '46 '47 1948
99% PURE FUSED SODA ASH
PURITE
The Scientific Flux for Better Melting and Cleaner Iron

they cure "YAWNING" on the job...

PUBLIC LIBRARY
MAY 31 1949
DETROIT

. . . with NICKEL CAST IRON

"Yawn" or "give" in a cast machine part often spells rejects for the machine user.

No ordinary cast iron solves this problem, because the low elastic modulus of unalloyed iron under heavy stresses frequently permits dimensional changes.

But..."give" can be reduced to a negligible minimum.

In the 20-ton casting shown above, produced by Schneider Bowman Company, Inc., Philadelphia, Pa., for a large punch press made by Wiedemann Machine Company of Philadelphia . . ."give" was minimized by casting this part in iron containing 1.50 percent Nickel.

Developing 45,000 pounds per square inch tensile strength in heavy sections, this casting exemplifies the high elastic modulus and strength obtainable with Nickel cast iron.

Hundreds of foundries now use Nickel cast iron to secure these basic advantages:

IN THE FOUNDRY—
Nickel aids the progressive foundry to meet high mechanical property specifications.

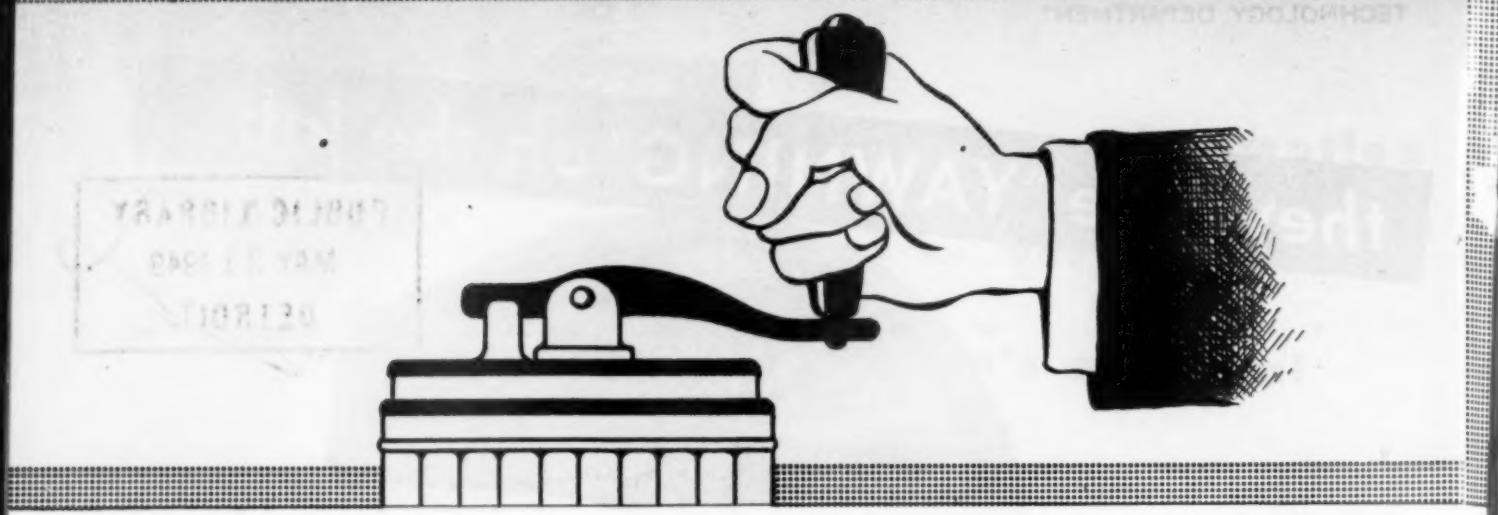
IN THE MACHINE SHOP—
Nickel cast irons provide strong, readily machinable castings that take a smooth finish.

IN SERVICE LIFE—
Nickel cast irons assure long, trouble-free performance for the ultimate user.

EMBLEM OF INCO SERVICE
TRADE MARK

Over the years, International Nickel has accumulated a fund of useful information on the selection, fabrication, treatment and performance of engineering alloy steels, stainless steels, cast irons, copper-base and other alloys containing Nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET
NEW YORK 5, N. Y.



CONTROLLED STRENGTH

The motorman's touch controls the power of the current that drives the street car. It's that simple. In foundries everywhere,

FEDERAL *Green Bond*

controls sand strength by the proportion of its mix. It's that simple. GREEN BOND may be mixed to produce a firm, stable sand, or a sand that collapses readily and flows freely. GREEN BOND is always uniform, always dependable. The quality never varies in a bag or a carload. Its wide use and general acceptance by practical foundrymen is its best recommendation.

BEST OF THE WYOMING BENTONITES

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

Seacoal Plant — Mines

CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • NEW YORK • ST. LOUIS • RICHMOND, VA. • UPTON, WYO.

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JUNE, 1949

THE FOUNDRY

VOLUME 77—NUMBER 6

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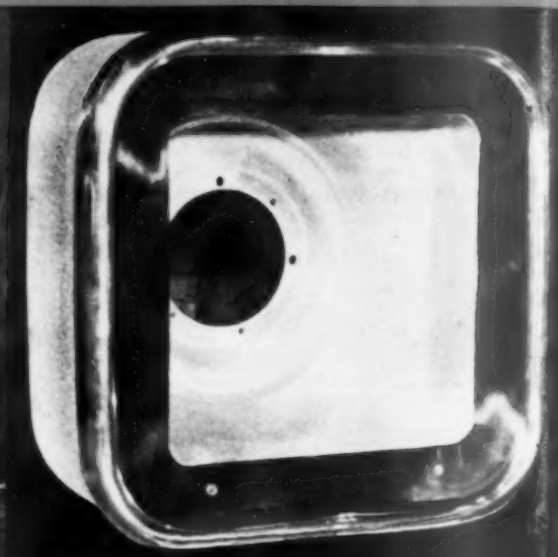
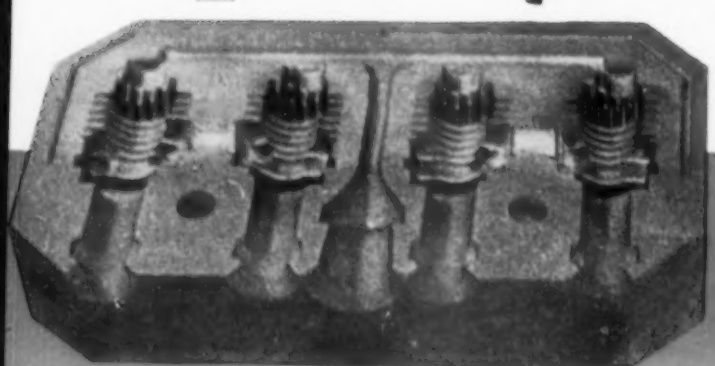
CORES FOR ALUMINUM . . . CORES



ALUMINUM TUB CASTING . . the square design is a Maytag exclusive . . gives increased water action without clothes abuse.

at THE M

TUB CASTING ASSEMBLY LINE . . . 250 tub molds are set up every hour. Note the amount of green sand core supported by the LINOIL-bonded crown core.



CORES FOR THE IRON FOUNDRY . . . core-mold for the "Multi-Motor" gasoline engine and power housing.

CROWN CORE FOR THE TUB CASTING .

FOR GRAY IRON *all with* LINOIL

THE MAYTAG "MASTER" WASHER

MAYTAG COMPANY, Newton, Iowa

Two foundries, one gray iron and one aluminum, comprise part of the huge Maytag plant in Newton, Iowa—home of the famous Maytag washers. Castings from these foundries have gone into more than 5½ million Maytag washers . . . used in all corners of the globe.

The iron foundry casts such washer parts as transmission housings...power-house units...twin cylinder "Multi-Motor" gas engines...makes both interior cores and core molds. Cores need strength and hardness to bind at pouring temperatures of 2750°...a smooth finish for close machining...toughness to take the rough production-line handling.

Cores for the high-geared aluminum foundry meet different requirements. To keep 250 flawless washer tubs rolling off the shake-out lines, the crown core (which forms the lip of the tub) must be soft...collapsing readily at mold temperatures of only 1470°...and yet have the strength to support the heavy weight of the green sand core above it.

Two foundries, two entirely different core problems, but one core oil —LINOIL. That's why LINOIL is known as the logical oil for cores.

THE LINOIL — THE LOGICAL OIL

THE WERNER G. SMITH COMPANY

(DIVISION OF ARCHER-DANIELS-MIDLAND COMPANY)

2191 WEST 110th STREET · CLEVELAND 2, OHIO

THIS NEW ROTOBLAST* ROOM CLEANS ENTIRE FOUNDRY OUTPUT IN HARRIS-SEYBOLD'S CLEVELAND PLANT

PANGBORN Cleans Castings...

Yes—this *new* Pangborn ROTOBLAST Room completely cleans *every single casting* Harris-Seybold makes for their famous offset printing presses. That means old-fashioned sand-blasting bottlenecks are now eliminated . . . and manpower requirements are cut from *144* man-hours a day to just *16!*

Castings are also cleaner than ever before, even though the intricate work ranges from *one pound* to *one ton!* The special Pangborn ROTOBLAST Room removes all micro-chill and burnt sand, opens up the metal pores and gets rid of rust from aging. *Nothing* is left on the castings to wear expensive machine tools.

ROTOBLAST Can Boost Your Foundry's Efficiency

Whether you need a special Room like this, or a standard ROTOBLAST Table-Room, Pangborn has the right equipment for you. Read the story at the right for general information, but for complete details write today for your free copy of Bulletin 211A. Address: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.

PANGBORN ROTOBLAST

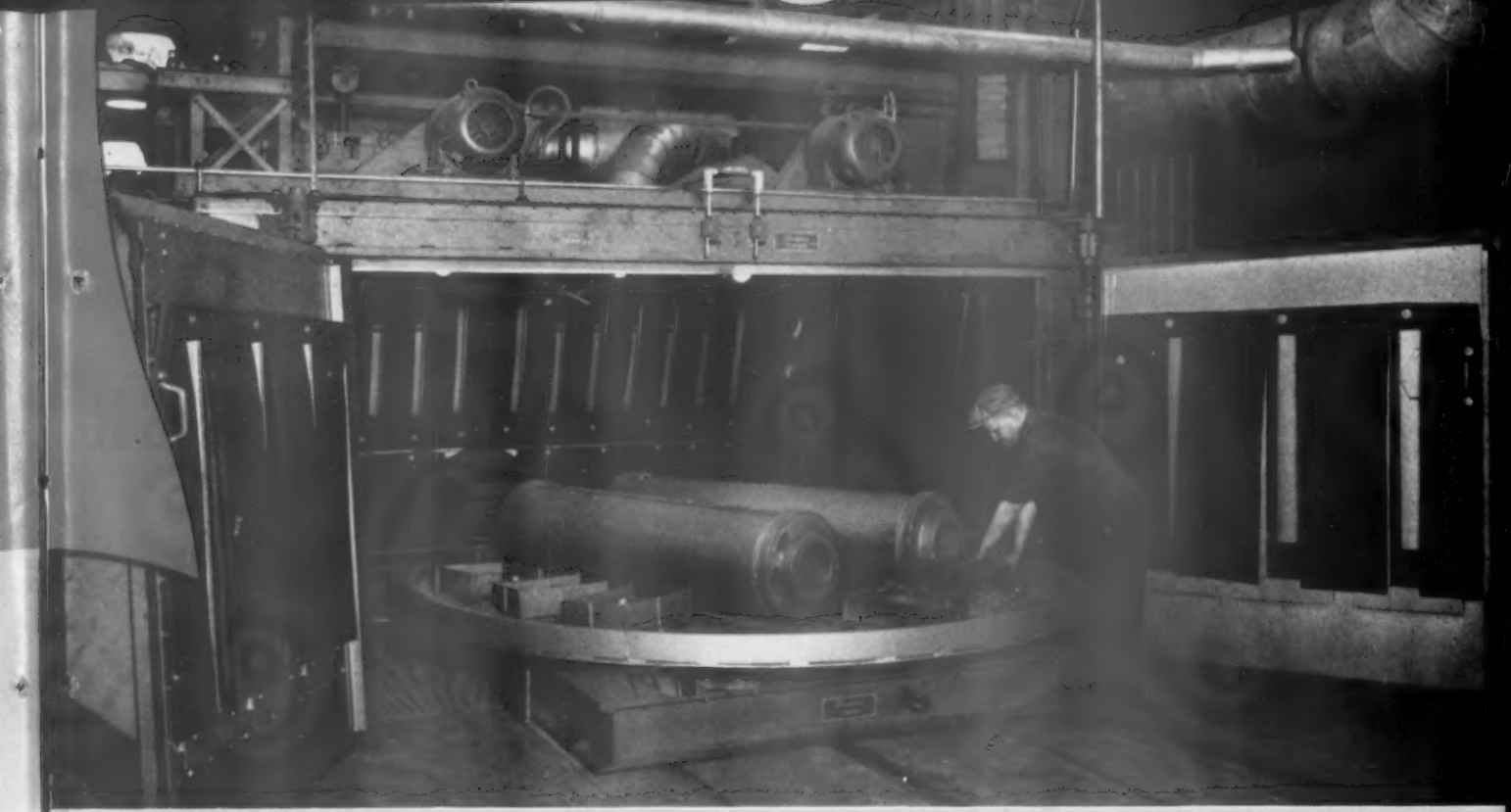
Cleans Faster *because it throws more abrasive . . . covers a larger area with greater density.*

Cleans Better *because it produces a finer surface than old-style methods.*

Cleans Cheaper *because it requires less horsepower to propel abrasive with velocity and quantity equal to any other method . . . uses less manpower . . . minimizes maintenance . . . eliminates need for air compressor investments.*

Pangborn

* Trademark of Pangborn Corporation



ONE WORKER can run this special ROTOBLAST *Room easily (Harris-Seybold uses two to speed up handling outside of Room). Before* ROTOBLAST *six men on three shifts were required to keep up with the work!*

ROTOBLAST Table-Rooms Increase Jobbing Foundry Efficiency!

Type "LK" ROTOBLAST Table-Room

JOBBING foundries can clean castings as thoroughly and almost as economically as specialty foundries with Pangborn ROTOBLAST Table-Rooms.

Table-Rooms do a quick, complete cleaning job on all types of ordinary or intricate castings . . . weighing anywhere from a few pounds and any shape, to 5,000-pound pieces up to five feet in length and thirty-six inches high.

The Table-Room is easy to operate. Simply put the castings on the table, close the doors, turn on the blast . . . and in a few minutes castings are cleaned down to virgin metal. No pit is required for installation, an experienced operator is unnecessary.

Specify ROTOBLAST Table-Rooms for *your* jobbing foundry. Standard models meet most requirements, and special ROTOBLAST equipment can be designed for special cleaning jobs. Write today for complete information. *Look to Pangborn for the latest developments in Blast Cleaning and Dust Control Equipment.*

MORE THAN 25,000 PANGBORN MACHINES SERVING INDUSTRY

BLAST CLEANS CHEAPER

with the right equipment for every job

Champion TO BETTER

A NEW MACHINE INTRODUCED *A NEW WAY* GIVES EVERY FOUNDRY AN OPPORTUNITY TO "CHAMPION-IZE" FOR HIGHER QUALITY AT LOWER COSTS.

IF you have been debating the question of installing core blowers, this message is intended especially for you. A new model Champion core blower, the "Junior", just announced to the industry, has the answers to your questions:

A CHAMPION BLOWS BETTER CORES FASTER, EASIER, AT LOWER COST!

From the giant CB-400 down to the CB-5 ("Junior"), the same advanced engineering features, precision construction and smooth operation of any Champion Core Blower give instantaneous action, uniform quality, with effortless ease.

By eliminating lost motion, spoilage and waste, by producing uniformly high quality product, and by making man-power more productive, Champion Core blowers have won a firm place in the foundry picture.

Take advantage now of the new introductory offer, to see what the "Champion Method" will do for you.

1. IS CORE BLOWING PRACTICAL FOR ME?

With the "Junior" machine, even the smallest foundry which produces duplicate castings will find it worthwhile to blow their cores.

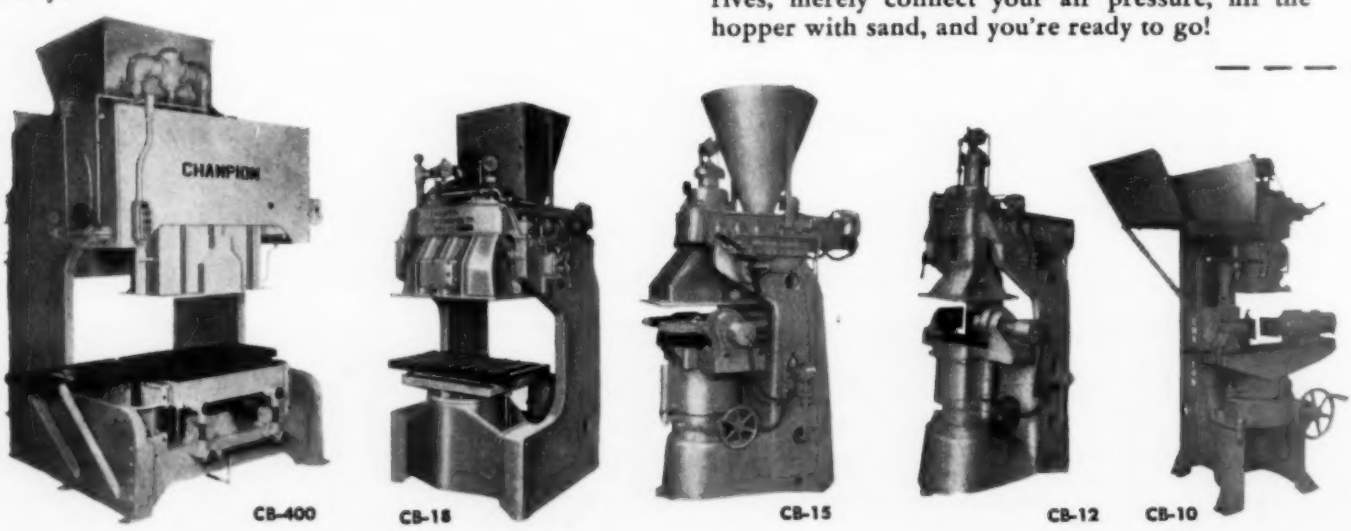
At a small investment, you have all the features of speed, uniformity and ease of handling that are characteristics of the largest model Champion.

2. HOW LONG DOES IT TAKE TO CHANGE OVER?

You'd be surprised! The introductory plan eliminates all red tape and unnecessary delay.

3. HOW DO I GO ABOUT IT?

Just send us a metal core box for the core you wish to blow with your order for a Champion CB-5 (the "Junior"). We will prepare the box for blowing, adjust the blower to the box, and ship the whole outfit to you without delay. When the machine arrives, merely connect your air pressure, fill the hopper with sand, and you're ready to go!



CB-400 CB-18 CB-15 CB-12 CB-10

Clears the Way!-

CORE PRODUCTION

"JUNIOR"

IS A TRUE CHAMPION WITH ALL CHAMPION FEATURES

There's really so little work required that many foundrymen have difficulty believing their eyes, when they first try out a Champion. Swing the head to the left under the hopper and fill the magazine with sand. Then swing it back in blowing position, with box in place. A simple easy movement of the valve lever instantly operates both horizontal and vertical core box clamps and blows the core.

Any Air Line with 85 Lbs. Pressure Is Adequate to Operate Any Champion Core Blower.

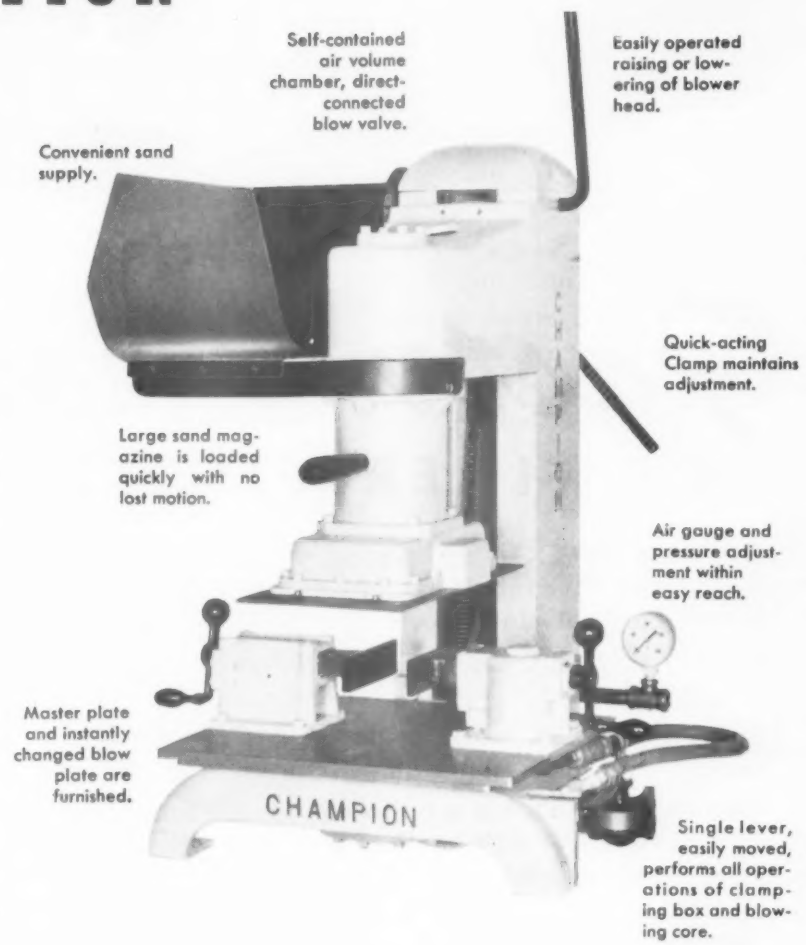
• • •

Again HERE'S ALL YOU HAVE TO DO:

Send us a core box to be used with a CB-5 core blower, along with your order. The machine will be shipped to you *ready to operate.* Merely supply air at 85 lbs. and sand.

• • •

Champion engineers and production specialists are glad at all times to give you the benefit of their long experience in helping you solve any mold or core making problems.


Self-contained air volume chamber, direct-connected blow valve.
Easily operated raising or lowering of blower head.
Convenient sand supply.
Quick-acting Clamp maintains adjustment.
Large sand magazine is loaded quickly with no lost motion.
Air gauge and pressure adjustment within easy reach.
Master plate and instantly changed blow plate are furnished.
CHAMPION
Single lever, easily moved, performs all operations of clamping box and blowing core.

To change from one core box to another, from one type to another, is the work of a minute or less. Blow plate is instantly removable, without use of bolts, screws, clamps or latches. Base plate with air-operated clamps for vertically split boxes, is also instantly removable by merely lifting it off; no tools needed, no mechanical fasteners involved.

CHAMPION FOUNDRY AND MACHINE COMPANY

SALES OFFICE: 1314 W. 21st STREET, CHICAGO 8, ILLINOIS

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MOLDING MACHINES CORE BLOWERS THE ELECTRIC RIDDLE

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8 Liljeholmsvagen, Stockholm, Sweden

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Avenida R. S. Pena 852, Buenos Aires, Argentina

Mauricio Hochschild & Cia. Ltd.
Casilla 153 D, Santiago, Chile

Societa Torinese Adesivi Resine
Corso Moncalieri 414, Torino, Italy

NEW . . . IMPROVED PARTING

DELTA PARTEX
NUT SHELL PARTING

FOR

Faster Production

OF FINER-FINISH CASTINGS

DELTA PARTEX is a superfine, waterproofed powder made from selected nut shells. It contains no harmful or hazardous ingredients. It is safe, easy and economical to use. It flows like water, dusts freely through the shaker bag and covers all surfaces uniformly.

DELTA PARTEX has the properties and characteristics of lycopodium at only a fraction of the cost.

DELTA PARTEX works faster, saves time and lasts longer. Core boxes and patterns stay cleaner with fewer applications.

DELTA PARTEX has a uniform surface affinity for sand. It will not pile up in corners. It is non-reactive with molten metal and will not pit nor etch metal patterns or core boxes. It will not contaminate or change the characteristics of core and molding sands.

Ask for a liberal working sample for test purposes and prove to yourself the advantages of DELTA PARTEX in your foundry.

9 IMPORTANT REASONS WHY DELTA PARTEX IS MORE EFFICIENT AND MORE ECONOMICAL TO USE . . .

1. No silicosis hazard.
2. Has the properties and characteristics of lycopodium.
3. Is non-reactive with molten metal.
4. Will not pit nor etch metal patterns and core boxes.
5. Will not contaminate nor reduce fusion point of core and molding sands.

6. Has uniform surface affinity for sand.
7. Leaves casting surfaces clean and free from contamination for plating work.
8. Is free-dusting through shaker bag.
9. Is moisture-resisting and will not deteriorate on aging.

DELTA OIL PRODUCTS CO.
MILWAUKEE 9, WISCONSIN

48 ROTO-CLONES police dust here!

Memphis Works of International Harvester Employ 3 Types of Roto-Clones For Complete Foundry Dust Control

Three type W Roto-Clones serve these six foundry shakeouts at Memphis Works of International Harvester.

THEY even harvest the dust at International! Grinders (both portable and stand type), abrasive cleaners, sand handling equipment and shakeouts—all are serviced by AAF Roto-Clones*.

Three types of Roto-Clones—D, W, and N—exhausting a total of over 300,000 CFM are used in this modern Memphis foundry. Above you see a battery of portable grinders served by a compact Type D unit. At left is pictured a group of six foundry shakeouts whose dust load is handled by 3 Type W Roto-Clones.

Regardless of the nature or quantity of the dust generated in your plant, there's an AAF Roto-Clone of a type and size designed for highest collection efficiency—plus simplicity, compactness and low operating cost. The experience of engineering Roto-Clones to solve thousands of dust problems is yours for the asking. For complete information, call your nearby AAF representative or write direct to—

AMERICAN AIR FILTER COMPANY, INC.
266 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

Get the Roto-Clone Story!
Bulletin No. 270-A describes the complete Roto-Clone line, its applications and advantages. Write for it now!

AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT

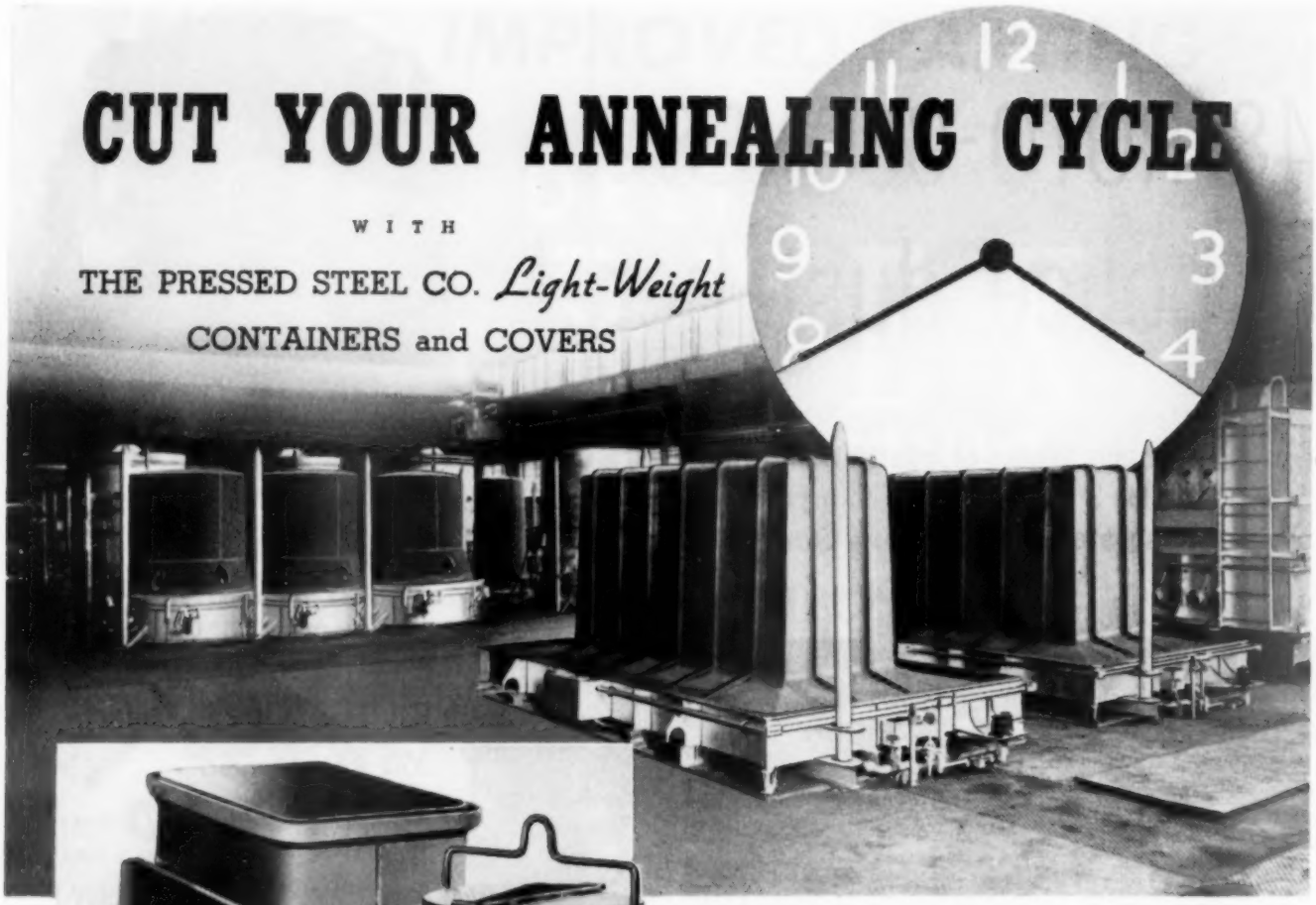
**Roto-Clone is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

CUT YOUR ANNEALING CYCLE

WITH

THE PRESSED STEEL CO. *Light-Weight*

CONTAINERS and COVERS



Pictured at top are rectangular and round annealing covers in a steel mill. Immediately above are several of the many types of containers which the Pressed Steel Co. furnishes for every annealing purpose.

By cutting 2/3 off the weight of annealing equipment, The Pressed Steel Co. units have, in some plants, shortened annealing cycles as much as five hours. And, because of their light weight, they also save substantially in handling time. Records of some installations show total savings of thousands of hours.

Weigh UP TO 2/3 LESS. Save Time and Fuel.

Because the Pressed Steel Co. light-weight annealing units attain pot heat in less time there is a real saving in fuel. A recent study showed a $40 fuel saving per anneal. Other savings: service life of 2 to 7 times that of cast boxes; made of light gauge welded sheet alloy, they are less bulky than cast boxes and, in cases, have doubled furnace capacity.

"Pressed Steel" light-weight sheet alloy heat-treating units are furnished in any size, design or metal specification: boxes, covers, baskets, racks, tubes, retorts, etc. As pioneers of welded alloy heat-treating equipment, we offer you a wealth of experienced engineering assistance and production know-how. Send blue prints or write as to your needs.

The PRESSED STEEL Co. PSC

THE PRESSED STEEL COMPANY

of WILKES-BARRE, PENNSYLVANIA

Industrial Equipment of Heat and Corrosion Resistant WEIGHT-SAVING *Sheet Alloys*

☆ ☆ ☆ OFFICES IN PRINCIPAL CITIES ☆ ☆ ☆

GET MORE POWER PER POUND WITH THE NEW *360 CYCLE* TOOLS

Rotor's new line of 360 Cycle Tools gives you:

More power, less weight . . . nearly twice the power of 180 cycle tools with the same size of motor . . . more than four times the power of universal electric tools per pound of weight.

High speed under load . . . Rotor 360 Cycle Tools slow down only about 5% under full load, compared to 20% for pneumatic tools and 45% for universal tools.

Result: Lower costs through increased production. Ask the Rotor Analyst to explain how the New Rotor 360 Cycle Tools also mean *lower installation cost and lower power cost.*

Write for a free copy of Bulletin 36 describing this new Rotor line of grinders, sanders, buffers and polishers.

360 CYCLE O'TOOL

LET'S KICK IT AROUND

by

TOM BARLOW

Under the spreading foundry roof
The E.C.P. man doth stand.
He's in a spot where he can't spoof.
Change gates — or change the sand!
— Apologies to everybody.

Every time I start to write, I wonder who will read the stuff or whom it may affect. Occasionally I am tempted to follow the lead of the rich play-boy who started his love letters, "Darling — and Gentlemen of the Jury."

Today I got a real thrill — a letter from Bombay, India, thanking me for helping Hank Winte write an article on "Shrink Bob Risers" for the August, 1945 issue of Foundry. Among other flattering things he says, "Deserving particular mention was a wedge-shaped locomotive axle-box guide which tapered from a channel section about 1⅛" thick at one end to a solid cross-section of about 6½" x 3" at the other end. By the use of a hot-gated shrink-bob riser of about 3¾" diameter, we were able to machine these wedges practically all over, free of cavities." Thank you, Bombay, India.

We don't sell gates and risers, but over the long pull we spend more time talking to our customers about

gates, risers, cupolas, scrap, etc., than about Black Hills Bentonite, Dixie Bond, Revivo, etc., etc. In the first place our products are so good we don't have to talk about them (ahem). So in the second place we boast about "Service that means something." In the third place, self-preservation is the strongest human instinct. (Freud says sex is — but not at my age.) Sometimes we must change gates or some other factor to avoid losing some valuable feature of the sand practice.

Once when confronted with some scrap castings, I felt the sand and found it to be perfect. I tried to explain that the sand was wonderful — it was only the castings that were no good. Unfortunately the customer wasn't selling the sand. He was selling castings. Reminds me of a metallurgist I know who still can't seem to realize that a foundry sells castings — not test-bars.

It's a darn shame that we still don't have good rules for gating castings. You can find nice fat formulae to build a bridge, a locomotive or even an airplane. Why can't you pick up a book and gate a casting? Oh, well, we've only been making castings for a few thousand years. Some day we will have the answers.

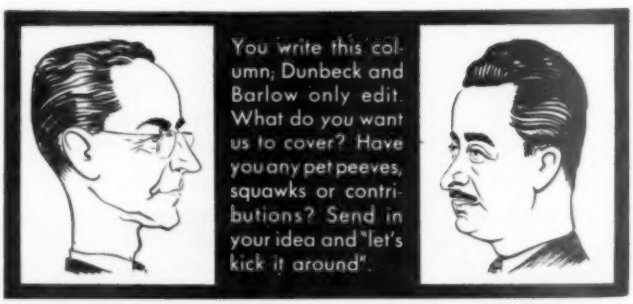
Lack of information on gates is not just inconvenient — it's doggone expensive. I don't mean its effect on scrap castings, either. The real cost of lack of knowledge of gates is that it impedes normal progress. Because we don't know enough about gates there is a tendency in some foundries to regard existing gates as sacred. The foundryman finds a gate that works and then sticks to it until dynamite blows him loose. Some of this attitude has changed because the changes in raw materials such as coke, pig iron, etc., during the past eight years have given the necessary dynamite impulse and forced some gate changes. But until gate changes are easy to make, they will still lead to trouble from "sacred gates" (not to be confused with "pearly gates".)

When a casting defect occurs it can be cured by a change in (1) design, (2) flask or pattern equipment, (3) metal, (4) sand or cores, (5) gates or (6) human element. Not very many of these factors can be changed except sand or gates. If the gates are sacred — was you dere, Sharley?

It used to be that the foundryman could change the metal to make his gates work. In most cases now, the composition is fixed by specifications of the customer. Ideally, the sand likewise should be fixed by the specification of the customer, i.e., it should be designed to give maximum finish, close dimensional tolerance, freedom from pinholes and blows, easy shakeout and rapid cleaning. The gates really should be made to suit the metal and the sand — not vice-versa. When you build a house you locate the door so it will be easy to get into the house — you don't move the house so as to make it convenient to find the door.

★ ★ ★

EASTERN CLAY PRODUCTS, Inc.
"Bonding clays sold with service"
JACKSON, OHIO


You write this column; Dunbeck and Barlow only edit. What do you want us to cover? Have you any pet peeves, squawks or contributions? Send in your idea and "let's kick it around".

DIXIE BOND • BLACK HILLS BENTONITE • REVIVO BOND • REVIVO SUPER BOND • BALANCED REVIVO

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50th birthday of the company whose products you know by the trade-mark: TIMKEN

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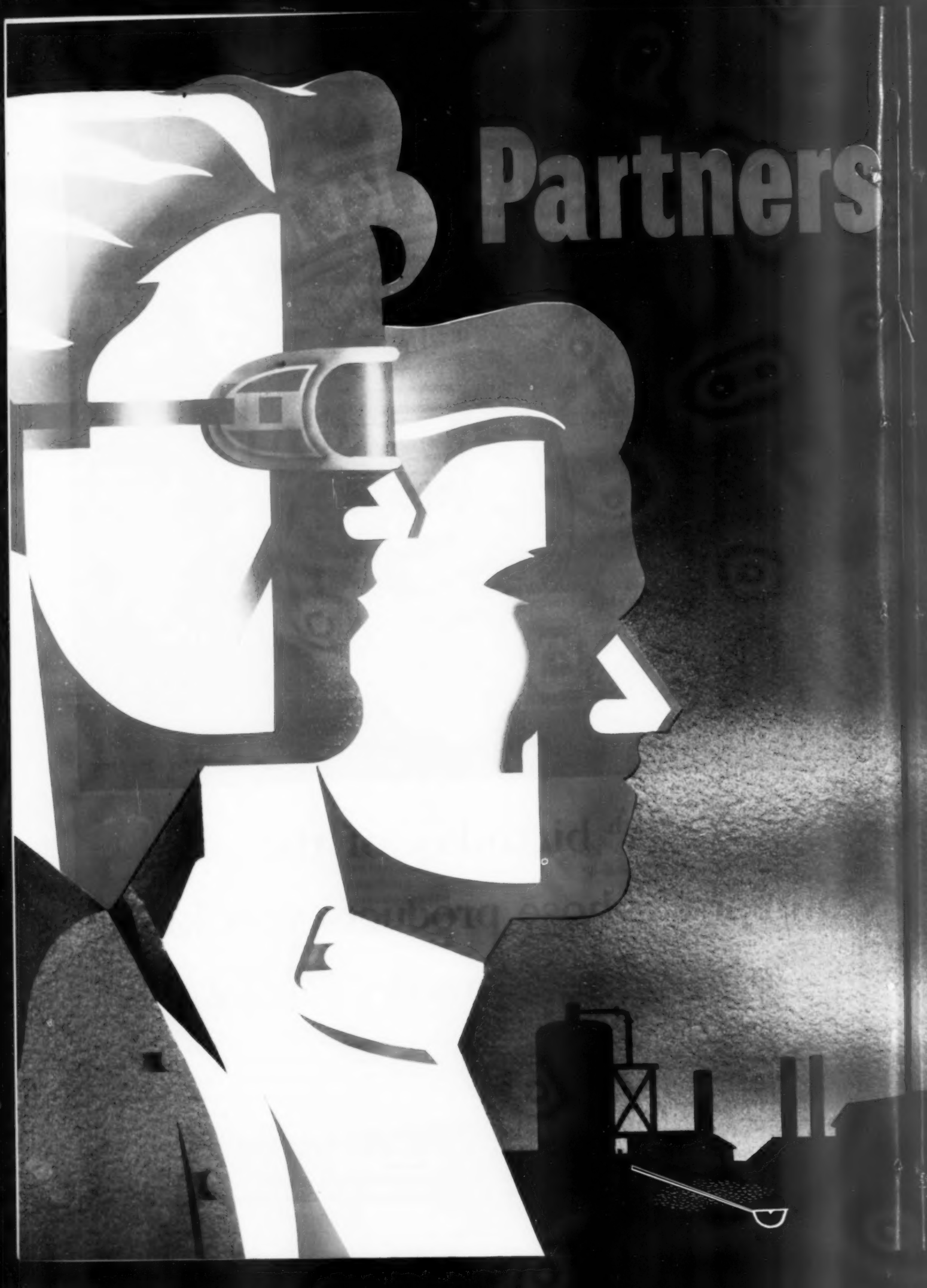
Registered as a trade-mark in the United States Patent Office, "TIMKEN" identifies products made by The Timken Roller Bearing Company: Timken tapered roller bearings, Timken alloy steels and seamless tubing and Timken removable rock bits.

Experience over the years has shown Timken products to be the finest in their respective fields. And many thousands of men and women are working hard to keep them that way. No wonder it has become a habit throughout industry to look for the trade-mark "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".


Partners

in Progress

A winning combination, this team-work between the foundryman and the research worker. Together they are furthering the progress, not only of the foundry world, but the American way of life as well. The research worker constantly seeks and develops new ways and means, methods and materials; the skilled foundry worker puts the results of that research to work. The result is new and better products made faster and at lower costs.

THIEM

Thiem Products, Inc. has long recognized the importance of research in foundry practices. From their laboratories have come new, superior core-washes and mold-coatings which complement the skill of your foundrymen. Always, Thiem welcomes the opportunity of working closely with you in solving production problems, in developing new products for which there is a need or demand.

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Over 10,000 installations of Coleman Ovens are proving their extraordinary money-making ability in every type of foundry in the United States today. It will pay you to investigate today.

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COLEMAN TOWER CORE OVEN
at Barnes Manufacturing Company, Mansfield, Ohio

Write today for Bulletin 48.

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Custom-tailored alloys to meet your most rigid casting requirements. Apex laboratory-controlled alloys are clean, grain-refined and uniform in composition. "Proved best in every test from ingot to casting." Alloy booklet available upon request.

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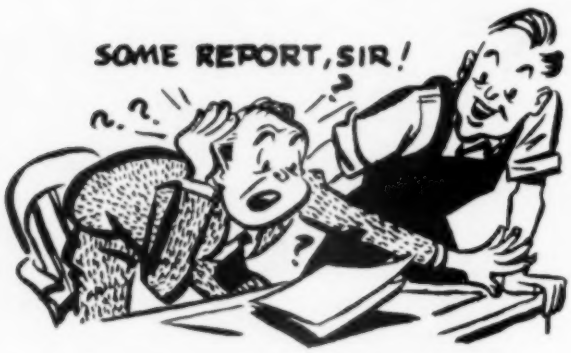
Field metallurgists are available for your foundry problems, casting engineering and alloy selection.

TESTS PROVE

PATENTED* Malleabrasive® CUTS

SHOT COSTS 35% TO 45%

for Cortland Forging Division of Brewer-Titchener Corporation



35% saved on shot costs alone! That's the result of Cortland's *first* 30-day test of *Malleabrasive* in their blast cleaning operations!

"It's too good to be true!" says the superintendent, 35% savings on shot is major league stuff. Put it back on test for another 30-days. Then we'll see!"

45% *savings on shot this time!* 70% saved on replacement parts . . . plus a finish 100% free of scale! That's the result of the *second* 30-day test . . . even greater, more conclusive proof of Malleabrasive's terrific cost-cutting performance!

You, Too, Can Cut Your Shot Costs

Malleabrasive can cut your blast cleaning costs as much as 50% because it differs from every type of shot and grit on the market today. It's more than "heat treated" or "annealed" . . . *Malleabrasive is guaranteed* to out-perform ordinary shot and grit, when comparative tests are properly run. *Get the facts.* Send for your free copy of recent Malleabrasive test results.
THE GLOBE STEEL ABRASIVE Co., Mansfield, Ohio.

Packed in new orange striped 100 pound bags.

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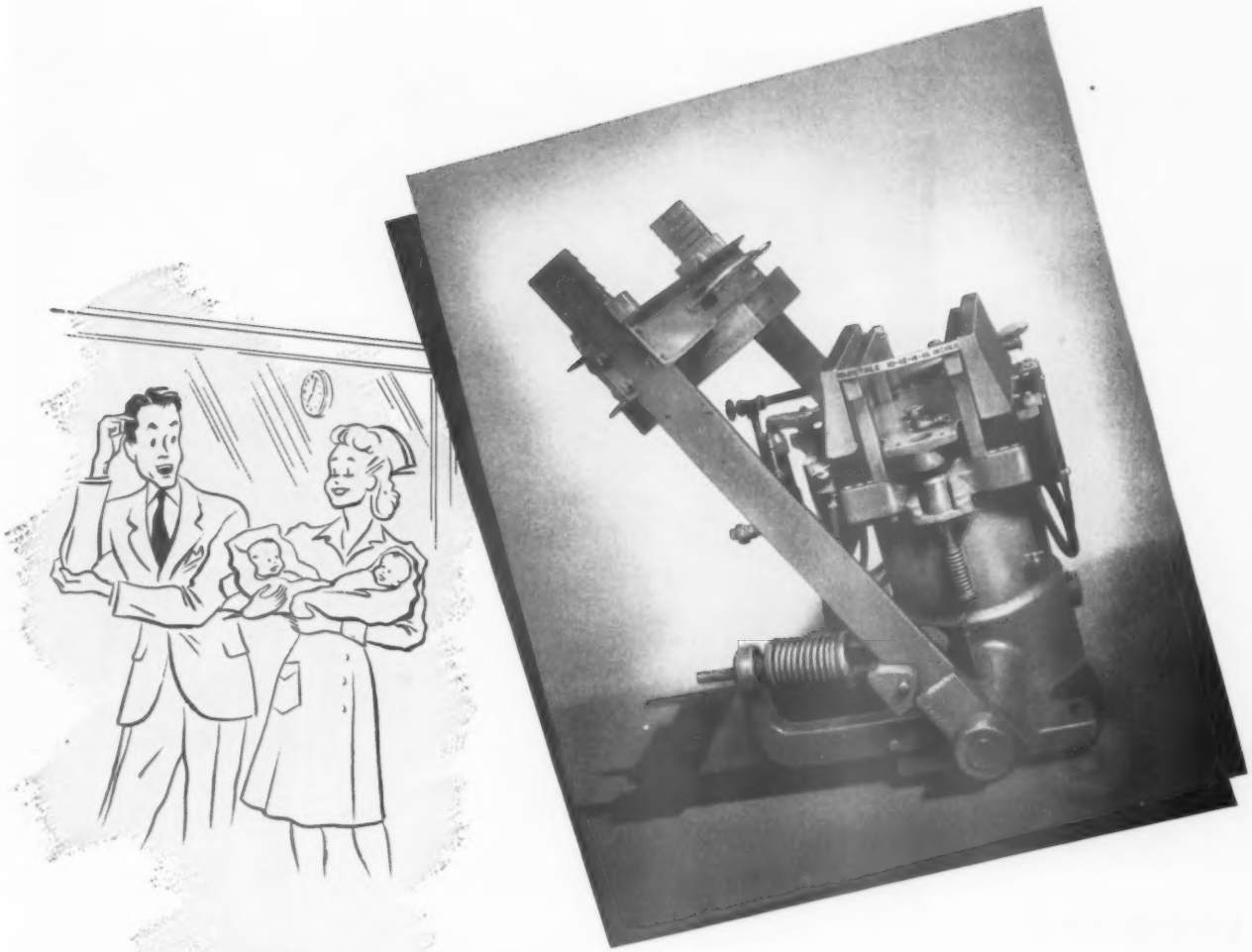
*U.S. Patent #2184926
(other patents pending.)

THE GLOBE STEEL ABRASIVE CO., MANSFIELD, OHIO

. MANUFACTURERS OF METAL ABRASIVES SINCE 1907 .



IT DELIVERS WHAT FOUNDRYMEN EXPECT

QUALITY molds and more of them—long life—low upkeep—flexibility that puts the machine "at home" in either production or jobbing shop . . . that's the story with this Tabor Yoke-type Jar-squeeze Flask-lift machine.

Design is the answer! Pattern plate supports and flask-lift sides keep a proper relation between pattern plate and flask surfaces. This means a "sand seal" when the mold is closed. Finning is eliminated . . . savings result.

Tolerances are so close that the match on the castings will depend only on the alignment of patterns.

In addition to its high-production features, this machine is flexible. Its 13"cylinder delivers a uniform squeeze—a smooth 4" draw. Adjustable open-end frame takes pattern plates 10" to 16" wide, at lengths limited only by the 260 sq. in. plate area. Also available with column- or cantilever-type head.

Write today for Bulletin #451 describing this worthy member of the Tabor family—a line of molding machines and allied foundry equipment built to *deliver* what foundrymen *expect.*

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, Calif.; The PacificGraphiteCompany,Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; M. W. Warren Coke Company, 1017 Olive Street, St. Louis 1, Mo.; E. R. Frost Company, Inc., Minneapolis 14, Minn.; Harry H. Reich, Trussville, Ala.

MANUFACTURERS ASSOCIATION INC. FOUNDRY EQUIPMENT

The TABOR Manufacturing Co.

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
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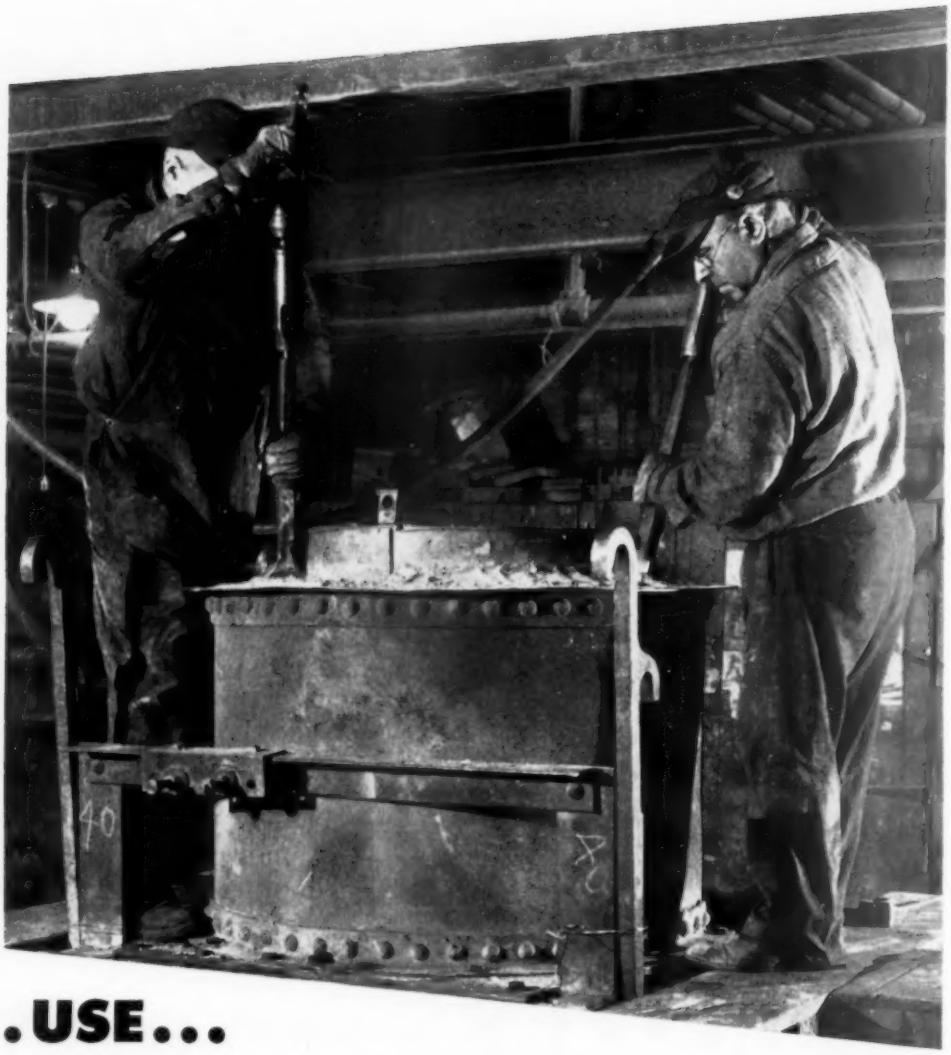

For Longer Life and Increased Production...USE...

TaSil pre-burned secondary blocks are preferred by many foundries. A variety of styles and sizes are produced. Write for prices and service data.

Taylor Sillimanite

No. 217 "AJAX" RAMMING MIX

Taylor Sillimanite No. 217 Ajax Ramming Mix and Tayco No. 219 Ajax Mix will give long life and increased furnace production, when used for either the crucible section or the slot or secondary block in Ajax-Wyatt induction furnaces melting yellow brass and high copper alloys. These mixes are designed for low permeability—high refractoriness—good ramming properties and high density.

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The CHAS. TAYLOR SONS Co.
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MANUFACTURERS OF REFRACTORIES • CINCINNATI • OHIO • U. S. A.

150 minutes slashed off production time

Formerly, the Pittsburgh Steel Foundry Co. removed sixty-pound riser pads from cast steel locomotive drive wheels by grinding . . . a slow, laborius procedure that took 3 hours per wheel.

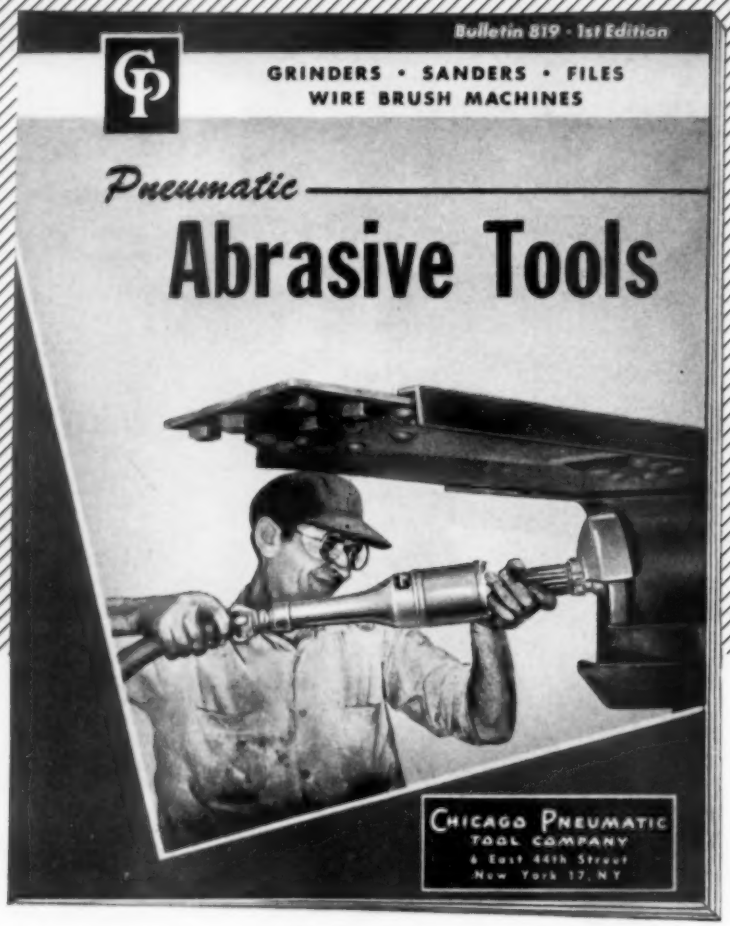
Now, using Airco's modern flame scarfing technique, similar riser pads are removed in thirty minutes; thus 150 minutes of grinding time per wheel are eliminated, castings are ready for finish machining.

This is another example of the manner in which Airco modern oxyacetylene and electric arc methods are helping progressive foundry operators slash production time and costs.

For details of other applications of these two versatile production tools in foundry operations, write your nearest Airco office. In Texas: Magnolia Airco Gas Products Company; on West Coast: Air Reduction Pacific Company.

AIRCO **AIR REDUCTION**
Offices in All Principal Cities

HEADQUARTERS FOR OXYGEN, ACETYLENE AND OTHER GASES...CARBIDE...GAS WELDING AND CUTTING APPARATUS AND SUPPLIES...ARC WELDERS, ELECTRODES AND ACCESSORIES



Write for your copy

If you use abrasive tools, you'll be interested in Bulletin No. 819, just issued by Chicago Pneumatic.

It contains descriptions, detailed specifications and application pictures covering the wide CP line of pneumatic grinders, sanders, files, wire brush machines and accessories.

CP grinders range from small wheel grinders and die grinders to the heavy-duty 4" to 8" "Steel-Clad" grinders. All types can be furnished with extension spindles, and there is a choice of straight, pistol grip and lever type handles.

The Bulletin also shows a variety of such special purpose tools as reciprocating files, rod grinders, and external tube end polishers. Write for your copy today.

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General Offices: 8 East 44th Street, New York 17, N. Y.

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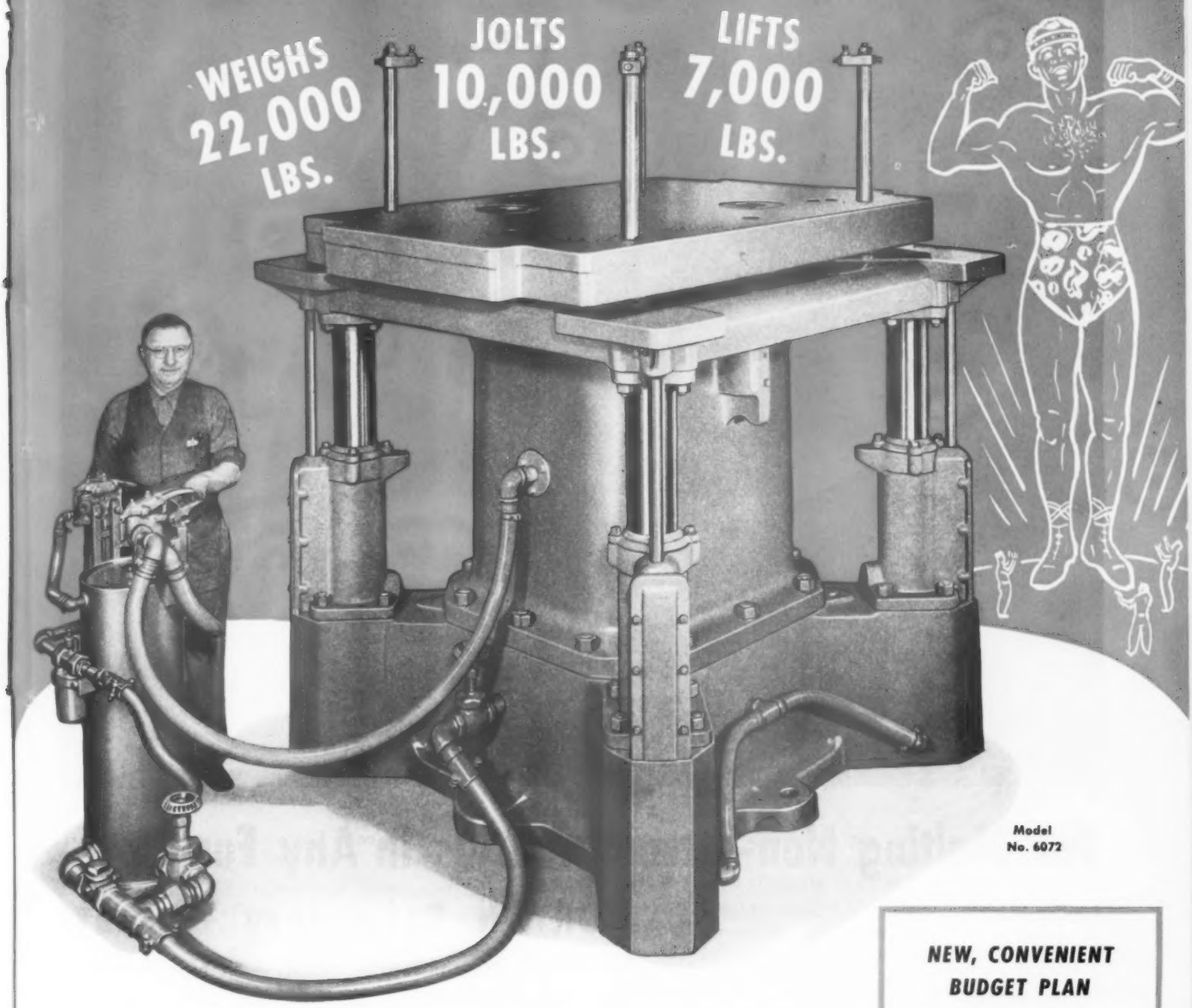
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

New Giant JOLT PIN LIFTER!



Model No. 6072

Here is a GIANT—Milwaukee's new Jolt Pin Lifter with greatly increased jolting and lifting capacities. Handles larger, heavier flasks with smooth performance throughout entire operating cycle. A precise hydraulically controlled pattern draw operates on the air-oil principle from a *separate* oil reservoir on which the control valves are mounted. Isolation of valves from base of machine eliminates wear resulting from vibration . . . reduces operator fatigue . . . results in improved machine performance. Draw available for either a constant, unvarying or accelerating upward stroke. Can be worked with a slinger, where needed. Fewest possible moving parts reduce wearing surfaces for continuous, trouble-free operation with minimum maintenance cost. Original accuracy of machine is retained by replacement of inexpensive machined parts. No special skill is required from operator. Maximum safety is provided by separate remote controls. Write for Bulletin.

NEW, CONVENIENT BUDGET PLAN

Under our liberal credit terms, only a small initial payment is required. The balance may be paid in small monthly amounts. Actually, you pay from the profits derived. Enables you to liquidate the cost of the machine while it works for you.

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--NORTON Refractory Cements

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NORTON REFRACTORIES®

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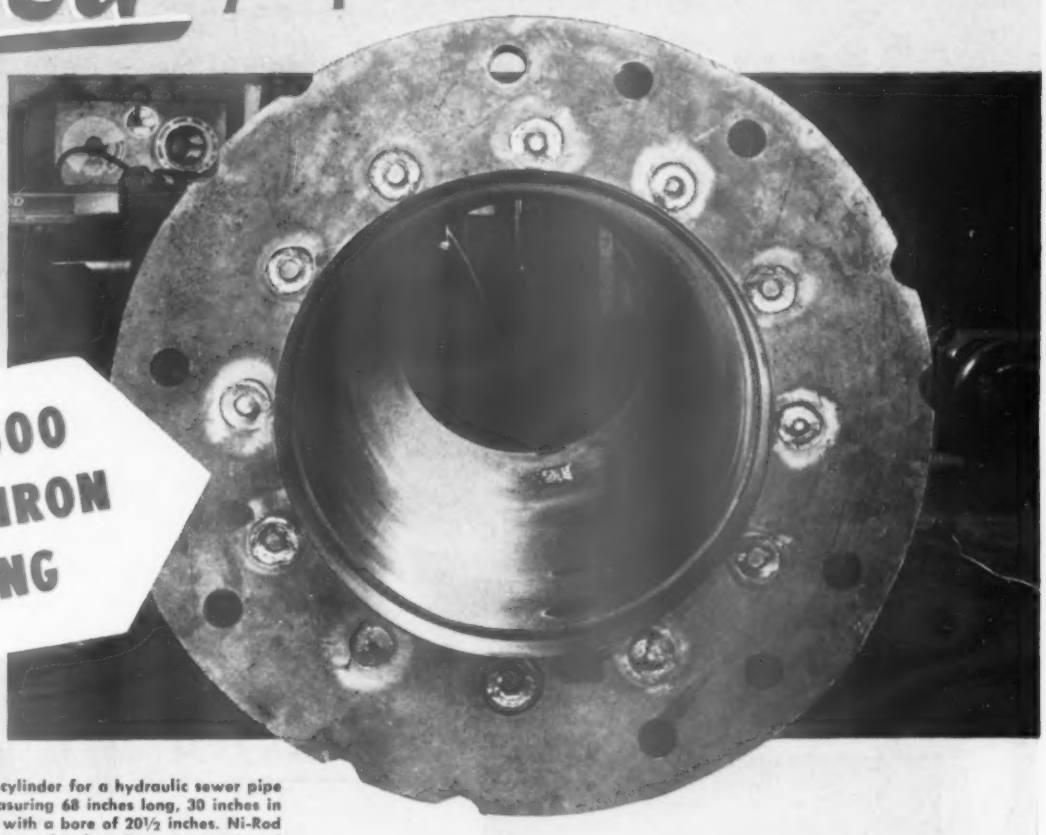
Saved by 5 pounds of NI·ROD...



Cast iron cylinder for a hydraulic sewer pipe press, measuring 68 inches long, 30 inches in diameter, with a bore of 20½ inches. Ni-Rod was used to weld plugs into unwanted stud holes, and fill a mislocated oil groove.

Here is a case where a small dose of Ni-Rod* cured a large technical headache.

When it was discovered that a relatively slight machining error had ruined an expensive 2500 pound casting, technicians of a West Coast machine company were dismayed.

The casting was to be used in a hydraulic press for forming sewer pipes. The mere matter of a mislocated oil groove — measuring only 7 inches long, 2 inches wide, and 1 inch deep — had rendered the cylinder useless for its intended purpose.

Remedies of all kinds were suggested but were regretfully discarded as impractical. When hope of saving the casting by ordinary means had faded, specialists of the Pacific Metals Company, Ltd., Los Angeles, were called in. They were immediately optimistic. They suggested welding with Ni-Rod.

Work was started at once. Welders carefully filled the misplaced oil groove with Ni-Rod. At the same time, still another alteration was attempted. 12 unwanted stud holes were blocked up by welding in cast iron plugs.

When the final remachining was complete, it proved almost impossible to tell where the welding had been done. The repair was successful in every respect, and spirits soared at the machine company's plant. With 5 pounds of Ni-Rod, costing only $7.50, they had saved a 2500 pound casting that had cost $1,000!

Reports such as this — reports of Ni-Rod's superior performance — are coming in from all parts of the nation. Shops everywhere are turning to Ni-Rod for better welds in cast iron, and dependable welds of cast iron to steel. If welding plays a part in your production or maintenance operations, find out more about Ni-Rod without delay. Send for your copy of "For Machinable Welds in Cast Iron."

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ANOTHER DIE CAST PRODUCT MADE BETTER ON KUX DIE CASTING EQUIPMENT

To Make a Better

Sharpener . . .

speedier and more economically

AUTOMATIC PENCIL

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SELECTED → KUX

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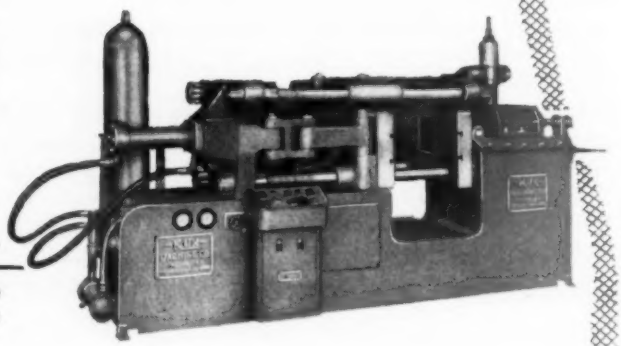
In designing their new Dexter model, the Automatic Pencil Sharpener Company considered appearance, performance and production of equal importance. To assure results as outstanding as the deluxe new Dexter has proved to be, Automatic chose KUX die casting equipment.

The exacting specifications demanded for superior die castings of the sharpener's base and uprights as well as internal mechanical parts, handle, and centering disc—a total of eight die castings—made the selection of KUX a natural one. Substantial economies of production resulting from the use of KUX machines offered further advantages.

Why not give your product the benefit of such economies and improved die casting techniques?



MODEL **BH-30** ILLUSTRATED

Hydraulically operated die casting Machine for production of lead, tin and zinc castings up to 10 pounds.

Write today for illustrated catalog showing complete line of KUX Die Casting Machines.

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POUR FAST . . . POUR OFTEN . . .

STERLINGS *Can Take It!*

Pouring Sterling Steel Flasks in a Large Midwest Production Foundry.

That's Why 4500 Foundries Use Sterlings

Yes, you can pour Sterling Heavy Duty Flasks as often as ten times a day . . . yet they retain their rigidity and accuracy over a long period of years. Custom-built, all-welded, one-piece Sterling Foundry Flasks have the strength and ruggedness to withstand hard usage. Sections are reinforced to resist torsion. Even jolt molding can't curl wide sand flanges. If partings need re-finishing, there is plenty of metal for several machinings. Patented inside flange simplifies ramming . . . prevents soft spots in mold under flange . . . speeds shake-out. For complete foundry flask service — consult STERLING.

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SOFFEL'S
THERMOTOMIC *

(Patents Pending)

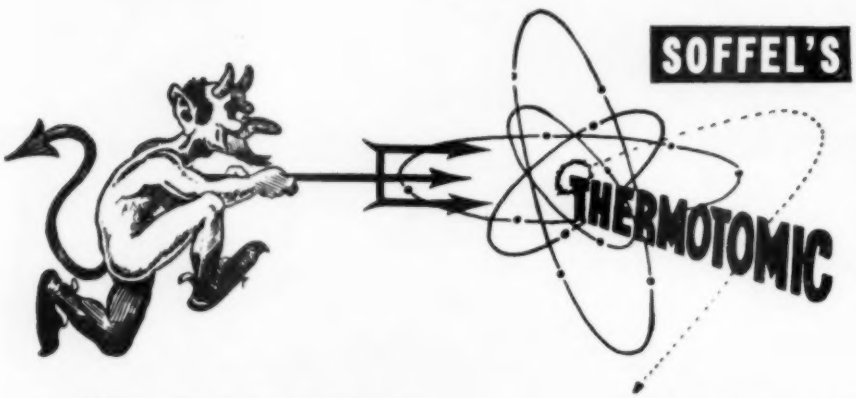
exothermic metal feeding compound

√ Cuts casting costs

√ Makes Better Castings

FOR STEEL, STAINLESS STEEL, GRAY OR MALLEABLE IRONS, COPPER, BRASS AND BRONZE

Better castings, more economically produced, result from the use of Soffel's Thermotomic—the exothermic metal feeding compound which keeps feeding metal molten longer. Here specifically are the benefits you get from Thermotomic:



Reduces Sizes of Riser and Feeder Heads

Heads and Risers Removed without Cutting and Burning

Increases Yield

Eliminates Shrinkage and Piping in Castings

What Thermotomic Is

Thermotomic Compound is an exothermic material which can be molded and baked into any desired shapes just as sand cores are made. It produces a temperature of 3500° F. It is used as ring inserts under the risers or feeding heads, or as facing inserts where it is desirable to maintain the fluidity of metal in the mold at those points where rapid cooling may cause piping, shrinkage, or segregation. Great savings are realized through reduced riser dimensions and cleaning costs.

Thermotomic For All Metals and Alloys

The widely different characteristics of metals used in castings require that Thermotomic be available with characteristics which will suit specific metals. Here are the types of Thermotomic and their uses:

Thermotomic WP:

(Waterproofed): For use in green sand molds with any of the above non-ferrous metals. Cores or inserts made of Thermotomic WP may be left in green sand for several hours or overnight without absorbing moisture from the mold. May also be used in dry sand molds.

Standard Thermotomic:

For use in dry sand molds with steel, stainless metals, gray or malleable iron, copper, brass and bronze.

Thermotomic X-235:

Has a double exothermic reaction; that is, after having burned through once, the terrific heat developed serves to set off another chain of chemical reactions within the material causing it to burn again with the development of even greater heat than that produced by the first burning. Recommended when it is desired to maintain temperature of the feeding metal for an unusually long period of time.

Thermotomic ABC:

Aluminum and magnesium may be adequately fed through feeding heads or risers with ABC Thermotomic ring cores placed under feeding heads and ALX-31 Liquidizer or surface of feeding metal in the heads or risers. Thus a reservoir of molten feeding metal will be maintained for a period of 30 minutes or longer. Chills can be eliminated in molds by keeping feeding metal liquid longer than the casting.

Soffel's Carbon-Free Liquidizer Is Recommended for Best Results

Best results and maximum feeding can be obtained from Thermotomic when Soffel's No. 5 Liquidizer is used in conjunction with it. This liquidizer, when applied on the surface of the feeding metal in all heads and risers enters into an exothermic reaction which serves to heat the upper portion of the metal while Thermotomic ring core heats the metal in the lower portion. No. 5 Liquidizer also provides an insulating cover which further delays cooling. Other types of Soffel's Liquidizers are available for conventional feeding heads and ingots. *Note:* With Thermotomic ABC, use Soffel's AL-X31 Liquidizer.

"Beware of Imitations"

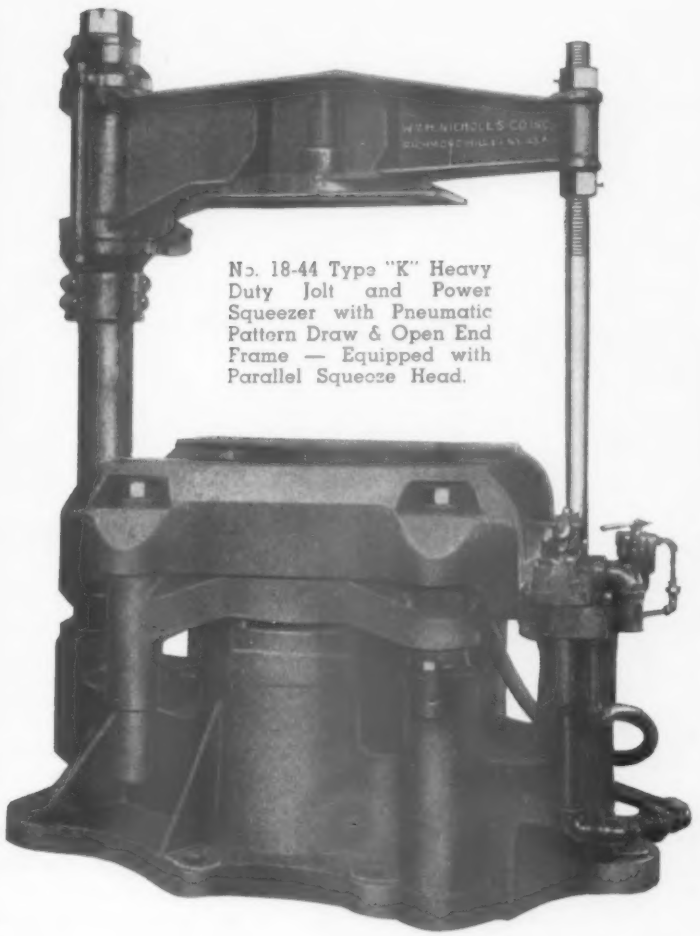
* Patent Pending.

Pittsburgh Metals Purifying Co.

World's Largest Manufacturers of Fluxes and Purifiers for Ferrous and Non-Ferrous Metals

1352 Marvista St., N. S. **Pittsburgh 12, Pa.**

A SHORT STORY ABOUT BIG OUTPUT AND LOW UPKEEP!



No. 18-44 Type "K" Heavy Duty Jolt and Power Squeezer with Pneumatic Pattern Draw & Open End Frame — Equipped with Parallel Squeeze Head.

NICHOLLS MOLDING MACHINES are used all over the world in the largest foundries where good castings in quantities are turned out daily. To assure satisfactory performance over extended periods, dirt-proof housings and forced lubrication have been provided for all parts that might otherwise wear quickly.

NICHOLLS MOLDING MACHINES have been engineered and designed with you in mind to operate smoothly and speedily. The number of moving parts are kept to a minimum, hence there is no lost motion and less confusion for new workmen. This scientific planning results in BIG OUTPUT and LOW UPKEEP!

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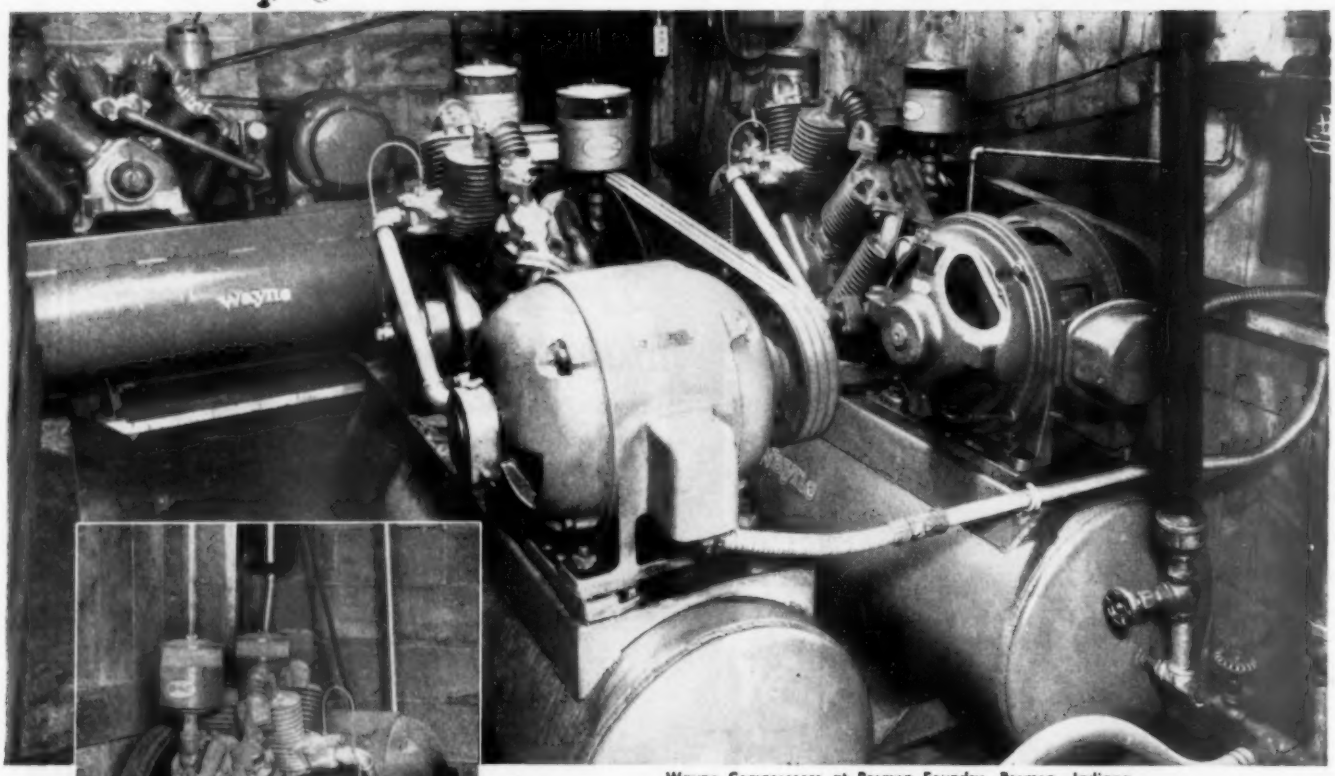
NICHOLLS

"NEVER WITHOUT AIR"



Wayne Compressors at Bremen Foundry, Bremen, Indiana

Decentralize AIR SUPPLY TO AVOID SHUTDOWNS

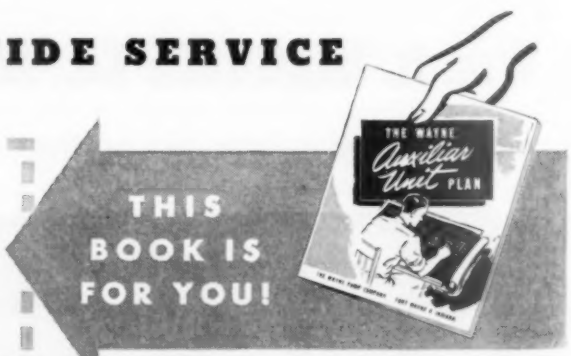
FOUNDRY OPERATORS like Wayne Air Compressors because of their rugged construction and long continued performance under the most difficult conditions. The Bremen Foundry has many Wayne units operating in banks to care for different departments so that a general air failure is impossible. Inexpensive replacement parts are kept on hand and any compressor needing repair can be put back in the line in a short time. They have never lost production for lack of air. Investigate the Wayne Auxiliary Unit Plan now.

BACKED BY NATIONWIDE SERVICE

THE WAYNE PUMP COMPANY · FORT WAYNE 4, INDIANA
523 Tecumseh Street
Please tell us more about Wayne Air Compressors and send booklet, "The Wayne Auxiliary Unit Plan." No obligation.

NAME _____ ADDRESS _____

CITY _____ STATE _____



LOADING DOCK LIFTS • POWER WASHERS LIFTS • HOSE REELS

Bulletin on SUPER REFRACTORIES

by CARBORUNDUM
TRADE MARK

NO. 3 JUNE, 1949

Using Super Refractories to Advantage

Super Refractories designed and produced by CARBORUNDUM are virtually *custom built* to meet a variety of operating conditions...conditions created by such variables as furnace-type, fuel, working temperatures, cycle, and material or ware being handled. Because of the complexity of selection factors, it is a good policy to consider each installation as a special case.

This line of super refractories consists of many varieties that offer a broad scope of refractory characteristics. Each of these variations is the result of solving special operating problems where other refractories failed to give satisfactory service. Because of the broad range of characteristics they provide, the wise use of these super refractories makes possible greatly improved performance in many furnace and kiln operations.

Their real economy has been demonstrated time and time again under circumstances varying from relatively low to extremely high temperatures. As frequently happens, a few brick or shapes eliminate costly localized trouble spots. On other occasions, complete installations have saved plants thousands of maintenance dollars.

To get the most from these super refractories, it is necessary to make careful problem analysis and then, judicious product selection. It's at this point that CARBORUNDUM engineers can be most helpful. They are technically trained in the fields of ceramic, chemical and mechanical engineering. Possessing extensive product knowledge and application experience, they fit the super refractory to the job. Their services are available promptly on request.

Physical Properties of Super Refractories by CARBORUNDUM
TRADE MARK

	CARBOFRAX	MULLFRAX	MULLFRAX S	ALFRAX K	ALFRAX B	ALFRAX BI
Heat Conductivity at 2200°F. in BTU/hr. sq. ft. and °F. /in. of thickness	109 BTU	16 BTU	9 BTU	24 BTU	12 BTU	7 BTU
REFRACTORINESS PCE CONE	37-40	38-39	37-38	37-39	39-40	38-39
SPALLING RESISTANCE	High	High	High	Good	Good	Good
ABRASION RESISTANCE	High	Medium	Medium	High	Medium	Low
THERMAL EXPANSION (25°—1400° C.)	.0000044	.0000059	.0000069	.0000074	.0000086	.0000086
MODULUS OF RUPTURE @ 2460° F. PSI	800-3125	100-250	175-475	100-1050	100-225	50-100
WEIGHT 9 IN. STRAIGHT	9.25 lbs.	9 lbs.	8 lbs.	10.1 lbs.	7.25 lbs.	4.8 lbs.

FIRST ONE—THEN ALL SIX

This battery of six crucible-type, oil fired melting furnaces is operated 5 days a week turning out 8 to 10 heats daily. Alloys of brass, bronze and nickel bronze are melted. At first, only one furnace was equipped with a CARBOFRAX silicon carbide lining. After more than a year's service, records were examined carefully. Among the important benefits realized were longer lining life, less patching, and lower maintenance costs Greater furnace efficiency was obtained as the thinner lining, 1¾" thick, permitted use of more insulation to lower heat capacity... conserve fuel.

As a result all six furnaces are now lined with CARBOFRAX tile...all operate at a higher rate of efficiency and economy

New Informative Booklet for Boiler Furnace Operators

In 32 amply illustrated pages, this new bulletin details uses and advantages of specialized super refractories in a variety of boiler furnace installations. Unique characteristics of these products are presented. Their advantages, in both cooled and non-cooled furnace linings, are explained. Line drawings indicate suggested locations for profitable usage. Copies may be obtained upon request. There is no charge.

"Carborundum," "Carbofrax," "Mullfrax," "Silfrax," "Alfrax" are registered trademarks which indicate manufacture by The Carborundum Company

Address all correspondence to: Dept. D-69, THE CARBORUNDUM COMPANY, Refractories Division, Perth Amboy, New Jersey

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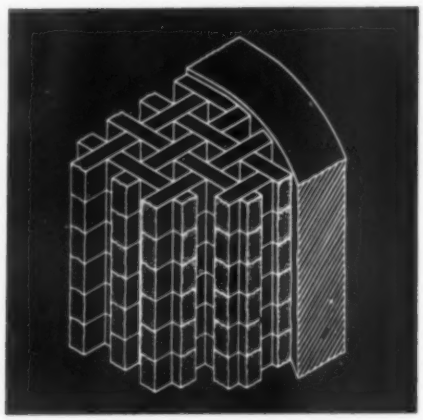
← Continued from other side

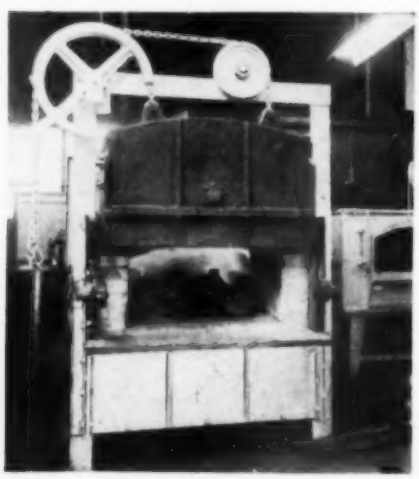
Added Help for More Gas-Make at Lower Cost



Improved oil efficiency, increased oil cracking capacity, solid fuel savings, and a reduction in checker maintenance are promoted by CARBOFRAX silicon carbide checker brick. Used in carburetors, super-heaters and oil gas generators, these checkers absorb more heat in shorter intervals. During the regenerative cycle this heat is released rapidly to the gas stream. Faster heat absorption and release are made possible by the high thermal conductivity and emissivity of CARBOFRAX brick. Their unique refractoriness, greater density and low iron content assure extended life and cleaner checker settings over longer periods.

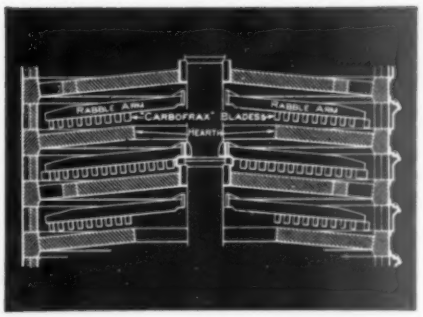
Ceramic Producer Boosts Output 40%

This manufacturer of wall and floor tile is using super refractories to good advantage. Switching from clay saggers to open setting has increased car capacity by 40%. Car schedule is continued at previous maximum level. The bisque wall tile are fired on CARBOFRAX silicon carbide tile and I-beam posts using 3-point support. The floor tile are burned in CARBOFRAX saggers on top of the car. After each trip, cars are torn down and reset. Due to greater mechanical strength and superior refractory characteristics, CARBOFRAX kiln furniture supports these heavier loads, resists handling, stands up under fast cycle...stays clean...does not warp or blister. It minimizes spotting... reduces rejections.



This Hearth Resists Mechanical and Thermal Abuse

Heavy castings are thrown in on this hearth with no attempt to avoid severe impact. The cold work is charged into the hot furnace and brought up to 1650°F. After a year of this severe service, the CARBOFRAX silicon carbide hearth remains straight and true... is perfectly level to accommodate long pieces that must be kept straight during normalizing and annealing. The high thermal conductivity of CARBOFRAX tile gives added advantages. More work is now being handled in this furnace, cycles are faster, and costs are far lower than when a fireclay hearth was used.



Tough Structural Problem Solved with Super Refractories

In this multiple hearth furnace—inside diameter 20 feet, height about 85 feet, with a total of 11 hearths—the lower 4 hearths present a very tough structural and service problem. Here, conditions are the most severe...temperature highest. Refractory materials originally used here gave a maximum service of less than *two months*. Such frequent replacement was expensive and recurring furnace shutdowns seriously hampered production. That was the situation when MULLFRAX electric furnace mullite brick were installed in this trouble zone. After four and a half years service, only one hearth required replacement. The remaining three MULLFRAX hearths appear capable of rendering several years additional life.

A complete file of informative literature covering super refractories is available through The Carborundum Company. There are facts and figures on installations in specific fields. To obtain copies of reports, booklets and catalogs of particular interest is a simple matter. Merely select from the list printed here. Copies will be sent you at once. No obligation, of course.

Super Refractories by CARBORUNDUM (general catalog)

Super Refractories for the Ceramic Industry

Super Refractories for the Process Industry

Super Refractories for Boiler Furnaces

Super Refractories for Heat Treatment Furnaces

Super Refractories for Gas Generators

The FRAX Line of Cements

CARBOFRAX Refractory Skid Rails

Bulletins Nos. 1, 2, 3 on Underdrain Systems and Diffuser Media

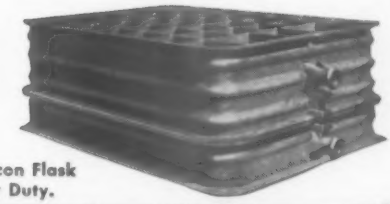
Dept. No. D-69

THE CARBORUNDUM COMPANY

Refractories Division

PERTH AMBOY, NEW JERSEY

Model TM-10 Truscon Flask for Two-Man Handling.



Model CH-40 Truscon Flask for Extra Heavy Duty.

HEADQUARTERS

FOR FOUNDRY FLASKS AND MATERIALS HANDLING EQUIPMENT

THE SUCCESS of modern foundry methods depends upon the efficiency with which materials and products in various stages of fabrication can be handled.

Truscon's Pressed Steel Division—nationally known for the quality of its products and the dependability of its service—is fully equipped and prepared to handle your foundry flask and materials handling requirements. The Pressed Steel Division's central location assures efficient service for your needs. Write for free catalogs describing Truscon Steel Foundry Flasks and Steel Boxes.

TRUSCON

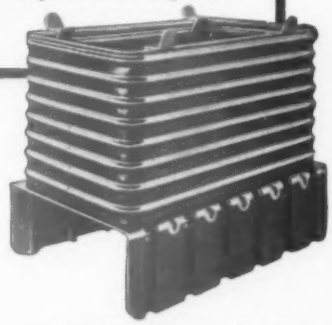
STEEL COMPANY
PRESSED STEEL DIVISION
6100 TRUSCON AVE.
CLEVELAND 4, OHIO
Subsidiary of Republic Steel Corporation

Model OM-1 Truscon Flask for One-Man Handling.

Type PB-650 Truscon Box and Platform with sliding End Door.

Type PB-120 Truscon Steel Box and Platform.

Truscon Double Face Steel Pallet.



Type PB-120T. Truscon Steel Box and Platform with Tiering Lugs.

for unusually good collapsibility

use CYCOR*191 synthetic resin binder for sand cores and dry molds

For the kind of collapsibility that helps insure uniform, smooth casting, standardize on CYCOR 191 . . . Cyanamid's liquid synthetic resin binder for sand cores and dry molds.

There are many other reasons, too, for using CYCOR 191 . . .

You purchase only *neat* synthetic resin, introducing additives to meet your own particular requirements.

CYCOR 191 gives real savings in production and BTUs by speeding up baking time in conventional ovens 33% to 50%. Use of this product in dielectric ovens results in a cure time of only 2 - 5 minutes.

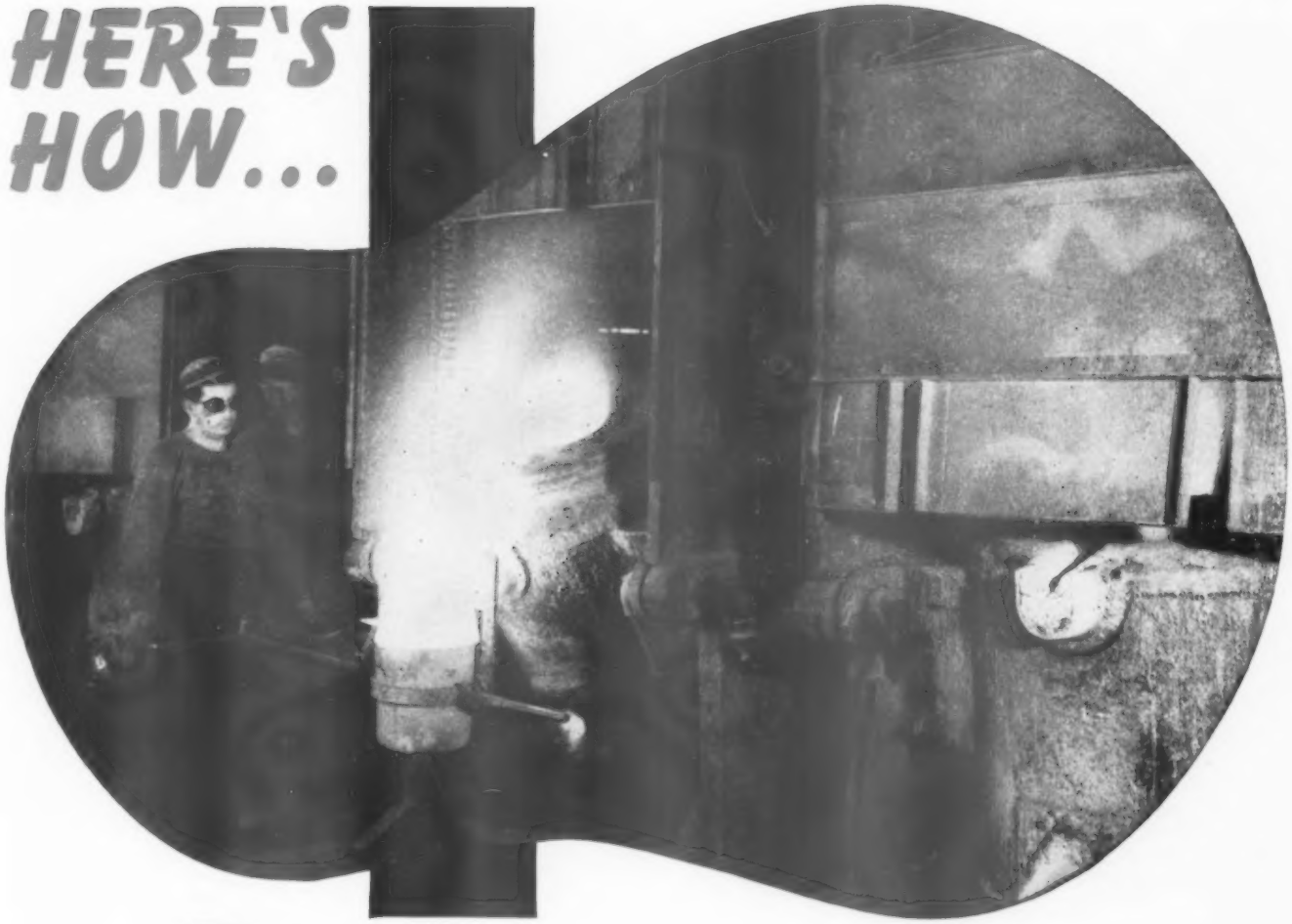
Yet CYCOR 191 costs no more than standard core oils.

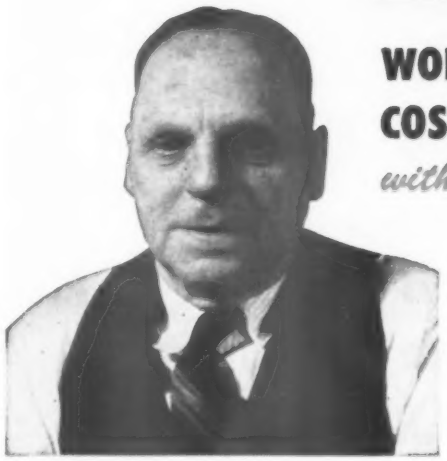
Want more information? Write for instructions or technical assistance on the use of this product.

*Reg. U. S. Pat. Off.

AMERICAN Cyanamid COMPANY
PLASTICS DEPARTMENT
38C ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

HERE'S HOW...





WOLVERINE BRASS WORKS REDUCES MAINTENANCE COSTS 80% — METAL LOSS TO 1%!

with LINDBERG-Fisher Tilting Furnaces!

Wolverine Brass Works, Grand Rapids, Michigan, prominent manufacturer of plumbing goods reports maintenance costs reduced 80%. Wolverine Brass installed Lindberg-Fisher Tilting Crucible Furnaces in their melting and pouring departments—they have operated these furnaces 9 hours a day, 5 days a week for 8 years. Their experiences show cleaner operation, increased safety, lower production costs, and greatly reduced maintenance costs and metal loss.

Mr. Fred H. Papke, Foundry Supt. says: "We like the Lindberg-Fisher furnaces because we can equip them with hoods in back and front, protecting the men from the smoke of the zinc fumes. Overflow or spillage metal is caught in easily cleaned basins and recovered at the end of each day. Lindberg-Fisher furnaces are easy to reline, and insert crucibles. Furnace covers move back and forth for easy repair. In my foundry experience on nonferrous metal, I find the Lindberg-Fisher furnaces economical and highly efficient."

HERE'S HOW:

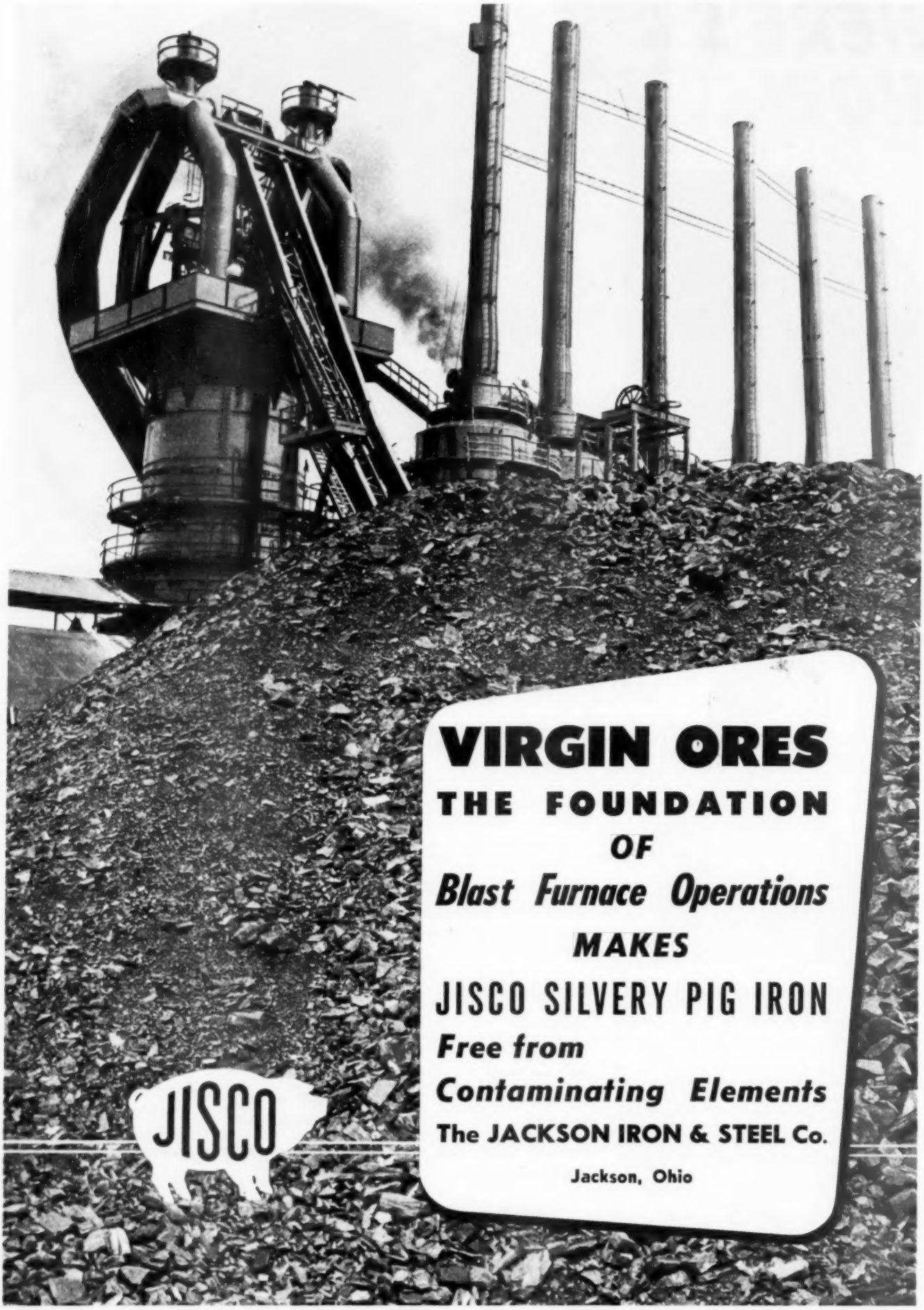
Equipment	12 Lindberg-Fisher Tilting Furnaces
Heats per day	7.0 heats per furnace
Lbs. per heat	606
Crucible life	131.5 heats per crucible
Metal loss	1% of total production

For full details call your local Lindberg-Fisher representative or write for Bulletin No. 57-A.

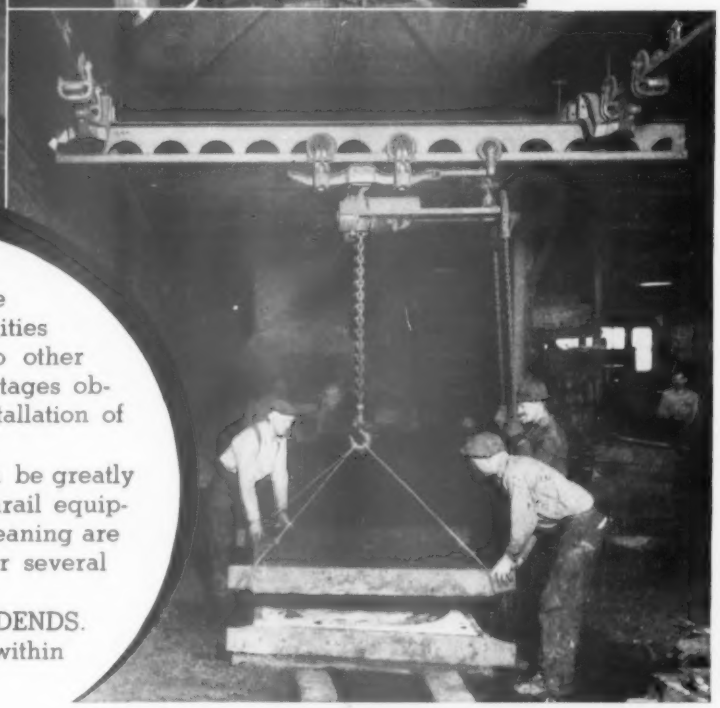
Fisher Furnaces

A DIVISION OF LINDBERG ENGINEERING CO.

2453 West Hubbard Street, Chicago 12, Illinois


VIRGIN ORES
THE FOUNDATION
OF
Blast Furnace Operations
MAKES
JISCO SILVERY PIG IRON
Free from
Contaminating Elements
The JACKSON IRON & STEEL Co.
Jackson, Ohio
JISCO

SPEED MOLD-MAKING
the efficient Cleveland Tramrail Way



Wherever materials of any kind in a foundry are lifted, moved or handled, there usually are possibilities for effecting important economies. Probably in no other way can so much be saved and as many advantages obtained for such a small investment as through installation of proper materials handling equipment.

Mold-making is one of the many jobs that can be greatly eased and speeded with overhead Cleveland Tramrail equipment. Pouring, sand-handling, cupola-charging, cleaning are others. Often the same equipment can be used for several different purposes.

Cleveland Tramrail pays dividends — BIG DIVIDENDS. Most installations pay for themselves out of savings within one year; some in less than six months.

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3806 East 286th St. Wickliffe, Ohio.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

SAVE
EXTRA HANDLING!

USE CMD *DUAL-PURPOSE CORE TRAYS*

The CMD Dual-Purpose Core Tray can be used for baking the cores, thus eliminating transfer of cores from core plate to core tray.

Because of their lock-stacking features, these trays make possible storage from the floor up. Bins and racks are no longer necessary.

SPECIFICATIONS

SIZE—12" X 24"

LOADING HEIGHT—4½"—6" OR 7"

OVERALL HEIGHT—5½"—7" OR 8"

WEIGHT—9½ POUNDS

MATERIAL—16 GA. SHEET METAL

SPOT WELDED (28 POINTS)

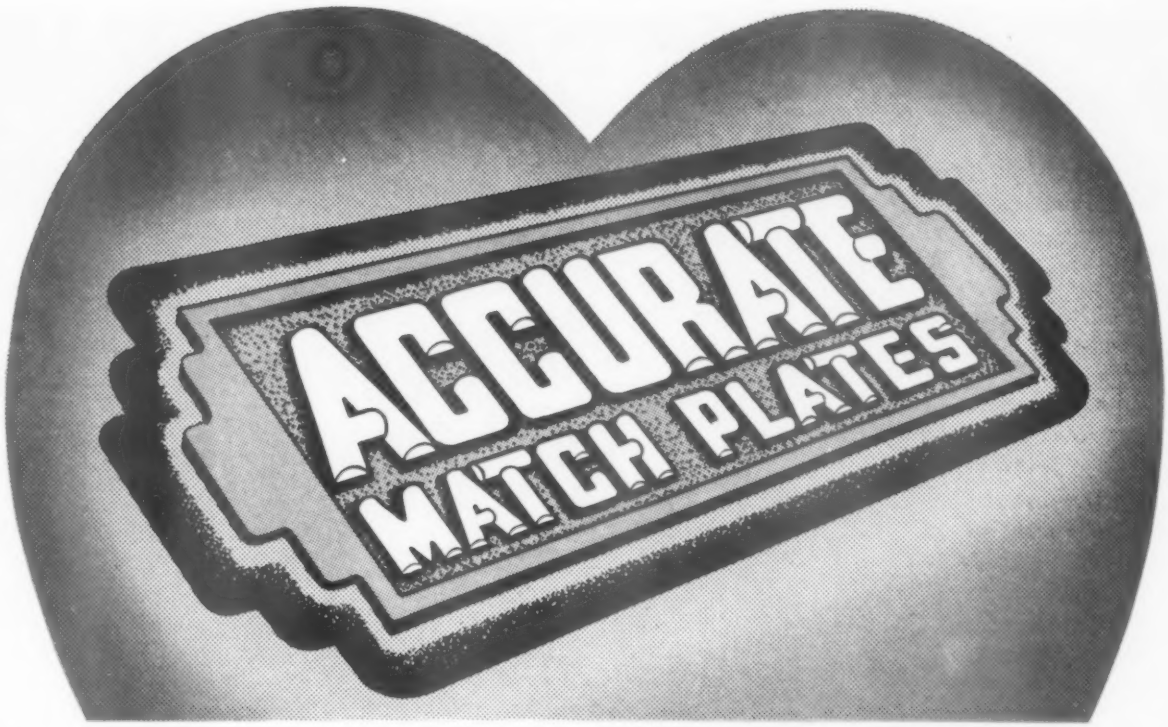
ALL ROUNDED CORNERS

2 BOTTOM REINFORCEMENT ANGLES

CONSTRUCTED FOR STACKING

CHICAGO MANUFACTURING & DISTRIBUTING CO.

Dept. 5F, 1928 West 46th St. CMD Chicago 9, Illinois



The heart of every casting is the pattern...so it has to be "accurate"

The ACCURATE MATCH PLATE COMPANY is a specialized organization with the ability to meet your requirements accurately.

We are foremost in the manufacture of pressure cast match plates, both as to quality and quantity.

Our plant is a modern building, housing specialized equipment and highly skilled artisans under able supervision.

We manufacture the following types of PRESSURE CAST EQUIPMENT from Plaster Molds:

Aluminum MATCH PLATES, COPE AND DRAG SETS,
CORE BOX CASTINGS, and white metal and aluminum
PATTERN CASTINGS.

Aluminum cast under pressure in plaster molds insures accurate dimensions, adherence to detail and smooth surfaces.

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ACCURATE MATCH PLATE COMPANY

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"Foundry Equipment Arranged to Your Individual Requirements"

What JEFFREY Makes:

MOLD CONVEYORS
FLASK FILLERS
AERATORS
SANDITIONERS
PADDLE MIXERS
SCREENS
BIN VALVES
CONVEYORS
BUCKET ELEVATORS

A Jeffrey apron conveyor used for sprueing and sorting castings.

A typical view of Jeffrey sand handling and preparation in a large foundry.

-Here again,

Jeffrey-Equipped means Efficient Operation

THE JEFFREY MANUFACTURING COMPANY

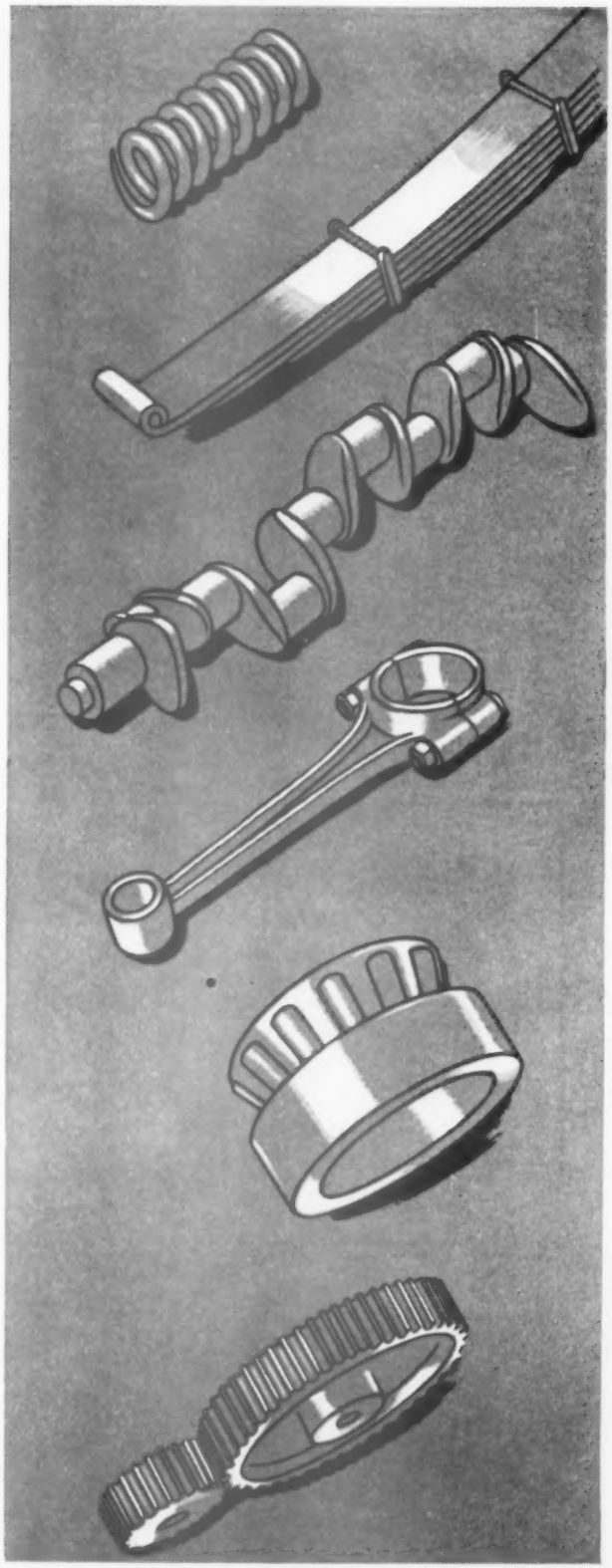
907 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

Baltimore 1	Buffalo 2	Cleveland 13	Harlan	Jacksonville	Pittsburgh 22
Birmingham 3	Chicago 1	Denver 2	Houston 5	Milwaukee	St. Louis 3
Boston 16	Cincinnati 2	Detroit 13	Huntington 19	New York 7	Salt Lake City 1
				Philadelphia 3	Scranton 3

VANADIUM

FOR HIGH DYNAMIC STRENGTH...



Vanadium steels are especially suited for parts subjected to high dynamic stress. Because of their uniformly fine grain size, they have exceptional resistance to shock and impact. Small amounts of vanadium in steel increase both yield strength and ductility. Vanadium-bearing steels are also noted for their high fatigue strength and abrasion resistance.

Vanadium steels are readily cast, forged, and rolled. They are also easily welded. When vanadium is added to steel in quantities ranging from 0.05 to 0.20 per cent, heat-treatment is simplified. Bearing surfaces can be carburized or nitrided to give unusual wear resistance.

For the production of vanadium steels, ELECTROMET ferrovanadium, containing 50 to 55 per cent vanadium, is available for immediate delivery in grades and sizes suitable for any open-hearth or electric-furnace addition.

Take advantage of the services of ELECTROMET's staff of trained metallurgists. They will be glad to give complete on-the-job technical assistance in the use of ferro-vanadium or any other ELECTROMET ferro-alloy or alloying metal.

Write to the nearest ELECTROMET office.

ELECTRO METALLURGICAL DIVISION
Union Carbide and Carbon Corporation
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OFFICES: Birmingham • Chicago • Cleveland • Detroit
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Electromet
TRADE-MARK
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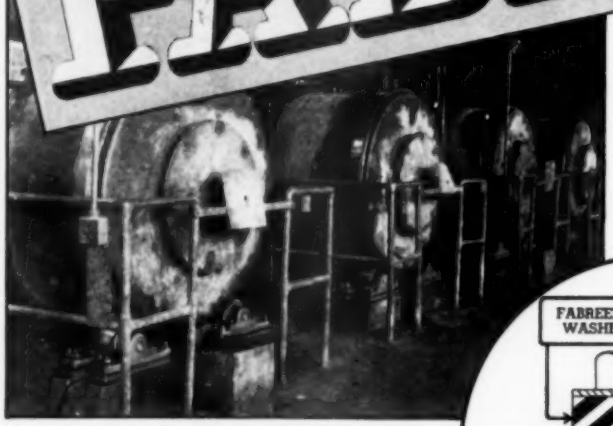
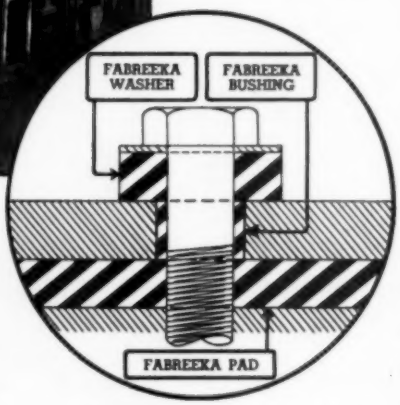
Under All Heavy Machinery

FABREEKA

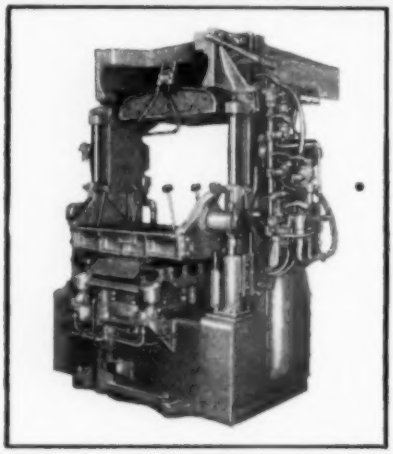


PADS, BUSHINGS, and WASHERS

Absorb Impact Shock and Reduce the Effect of Destructive Vibration

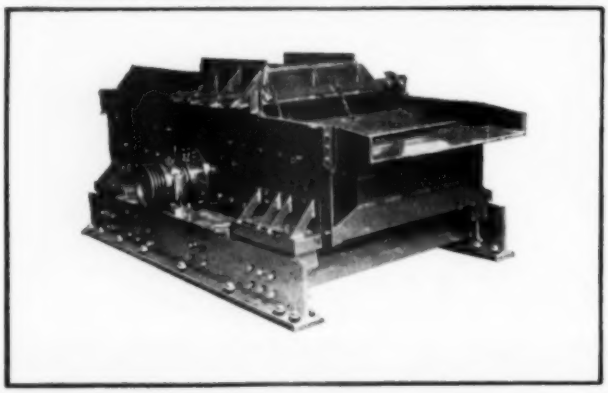


SHOWN AT LEFT
CROSS SECTION OF
FABREEKA INSTALLATION



FABREEKA Pads, bushings, and washers are installed under Shakeout Machines, Jolt Moulders, Tumbling Barrels and other heavy machinery to reduce the effects of heavy impact shocks and destructive vibration.

FABREEKA has demonstrated its ability to prevent breakage of machine parts and to keep bolts tight, thereby reducing maintenance and increasing production. In addition to these important advantages, Fabreeka has long life, which makes its final cost a low cost.



Write for latest literature

It Pays To Specify Fabreeka

FABREEKA PRODUCTS COMPANY, INCORPORATED
222B Summer Street
Boston 10, Mass.

for IMPACT SHOCK and VIBRATION

This Fork Truck DOES MORE WORK

FOR LESS "PAY"
because it has

DYNA-TORK *Drive*

Available *only* in CLARK'S gasoline-powered Utilitruc, DYNATORK DRIVE eliminates the clutch and conventional transmission. Nothing comparable in the fork-lift-truck field. Benefits so numerous that the important question is: CAN YOU AFFORD TO BE WITHOUT IT?

To help get the answer—to enjoy unsurpassed counsel on any materials-handling matters—CONSULT CLARK. Please direct inquiries on your business letterhead to address listed below.

INDUSTRIAL TRUCK DIVISION
CLARK EQUIPMENT COMPANY
BATTLE CREEK 16, MICHIGAN

AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

Constant . . . Development

Attention to Detail makes

FANNER CHAPLETS AND CHILLS

the Finest Procurable

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WE HAVE OVER
100,000,000
IN
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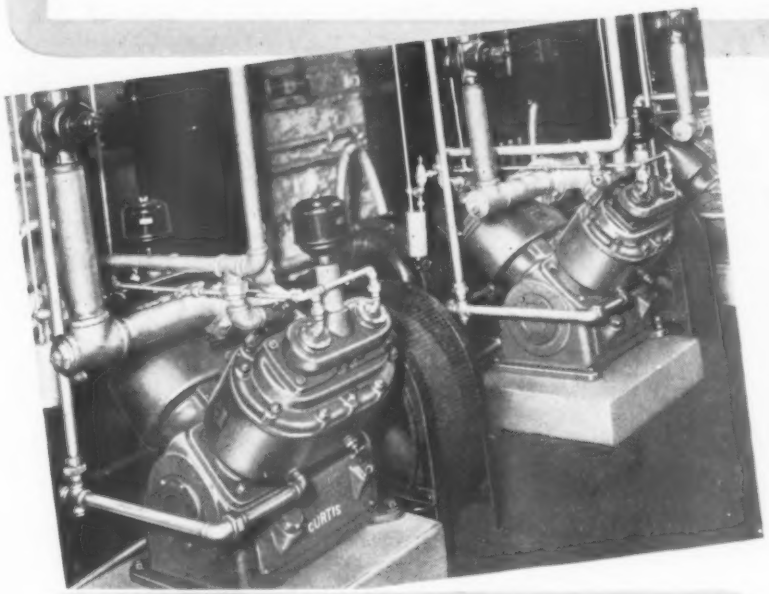
THE FANNER MANUFACTURING CO.

BROOKSIDE PARK
CLEVELAND, OHIO

CANADIAN FANNER, LTD. HAMILTON, ONTARIO

Birdseye view of the Fanner Brookside Park plant in Cleveland

Air for any use



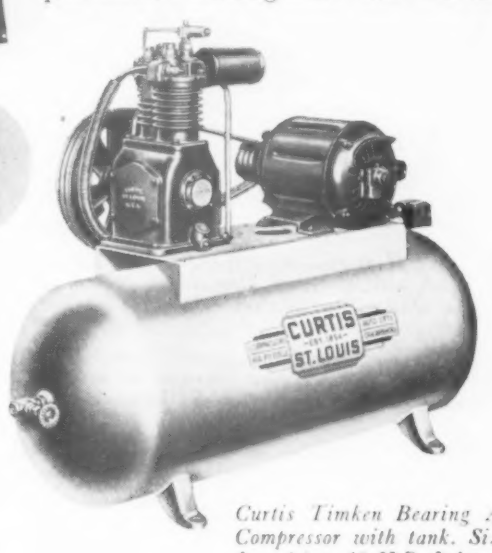
CURTIS AIR COMPRESSORS

Curtis Air Compressors are providing an adequate, economical supply of air to meet every imaginable requirement throughout the world.

CURTIS (Timken Bearing Equipped) Compressors offer —

- Large capacity per dollar of first cost
- High volumetric and mechanical efficiency assuring maximum air delivery per unit of power input
- Low maintenance expense

You get these advantages because Curtis Air Compressors have such design advantages as —



Curtis Timken Bearing Air Compressor with tank. Sizes from ¼ to 10 H.P. Industrial Air Compressors up to 50 H.P.

- Timken Roller Bearings
- Carbon-free disc valves
- Fully enclosed crankcase
- Accessible for inspection, adjustment or replacements
- Precision made
- Self-oiling—positive lubrication

95 Years of Successful Manufacturing

CURTIS

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ROSS

IF YOU PLAN TO PROFIT WITH MODERN

Hot Blast Cupola Heating

RECENT Installations Ordered From ROSS

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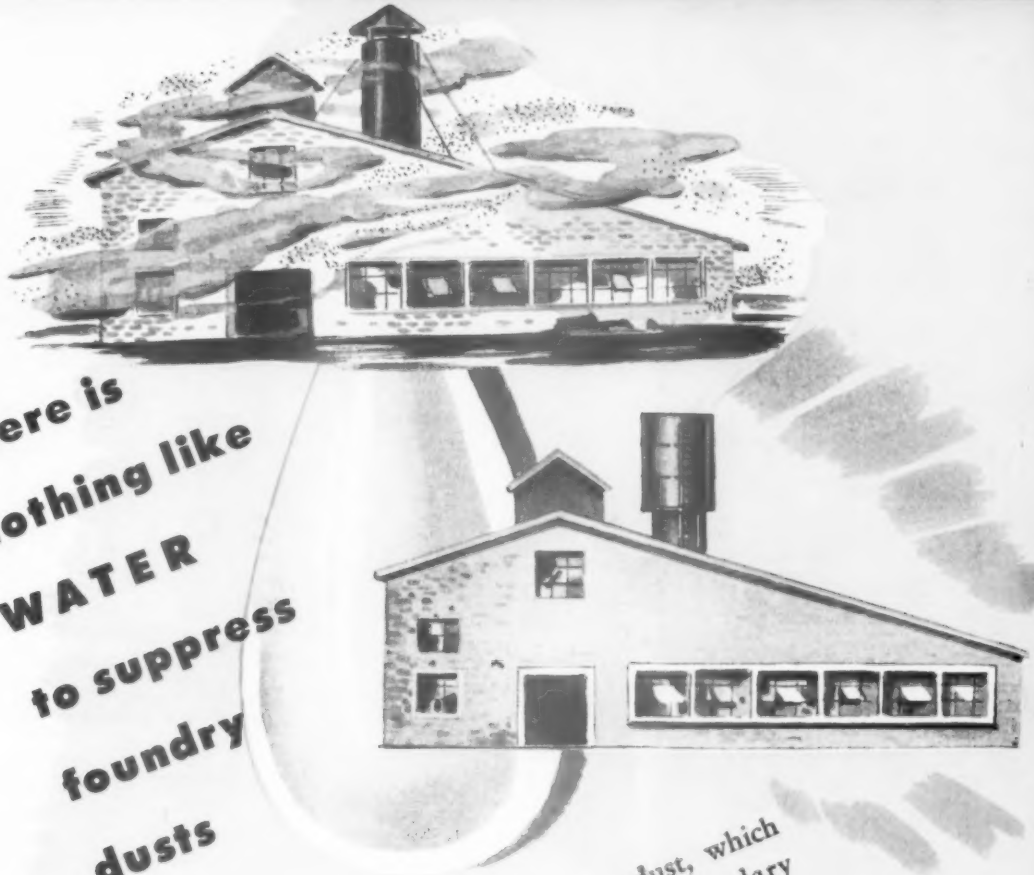
In every field of engineering there is one organization best equipped with practical knowledge and experience to maintain leadership in that field.

For designing and installing cupola heating systems, ROSS ENGINEERING is the recognized leader. Such leadership is understandable for the following reasons:

- Cupola heating is an air heating problem, a field in which Ross Engineering has specialized for nearly 30 years.
- Ross engineering heating systems have long been recognized throughout industry as the most efficient in design and operation.
- Ross Engineering builds the famous Ross Air Heaters that constitute the heart of all successful cupola heating systems.
- Ross Engineering is best equipped to install a complete job with proper number of heating sections for air volume needed, all duct work, platforms, etc.

If you are interested in a properly designed and installed cupola heating system to substantially reduce your operating costs, the logical source for specific information and recommendations is a Ross engineer. Utilize experience to get best results. J. O. ROSS ENGINEERING CORPORATION, 350 Madison Ave., New York 17, N. Y. Offices in Boston, Detroit, Chicago, Los Angeles, and Montreal, Canada.

Ross Engineering
Hot Blast Heating
Headquarters



There is nothing like WATER to suppress foundry dusts

MERE "collection" of dry dust, which involves the necessity of secondary handling, is at best only a partial answer to the problem of dust control.

Wetting means *true* suppression . . . reducing dust particles to harmless, easily disposable sludge and clearing the air of soluble gases and fumes. By copiously wetting every dust particle and every spark, Whiting Hydro-Clones give real dust control—make foundries cleaner and safer.

Whether your immediate problem is the cupola stack, or inside dust sources such as shake-outs, sand handling, grinders, tumblers, etc., you will find a Whiting Hydro-Clone specially engineered for the job.

WHITING HYDRO-CLONES suppress dust with water

WHITING CORPORATION

15607 Lathrop Ave., Harvey, Illinois

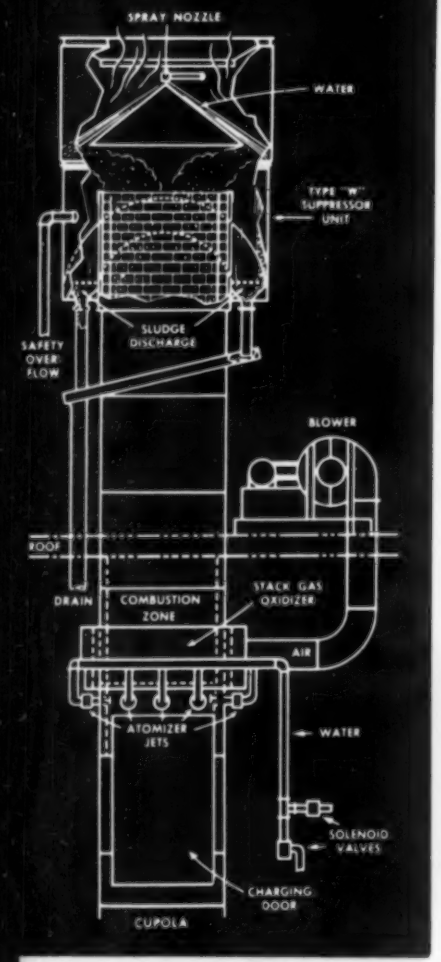
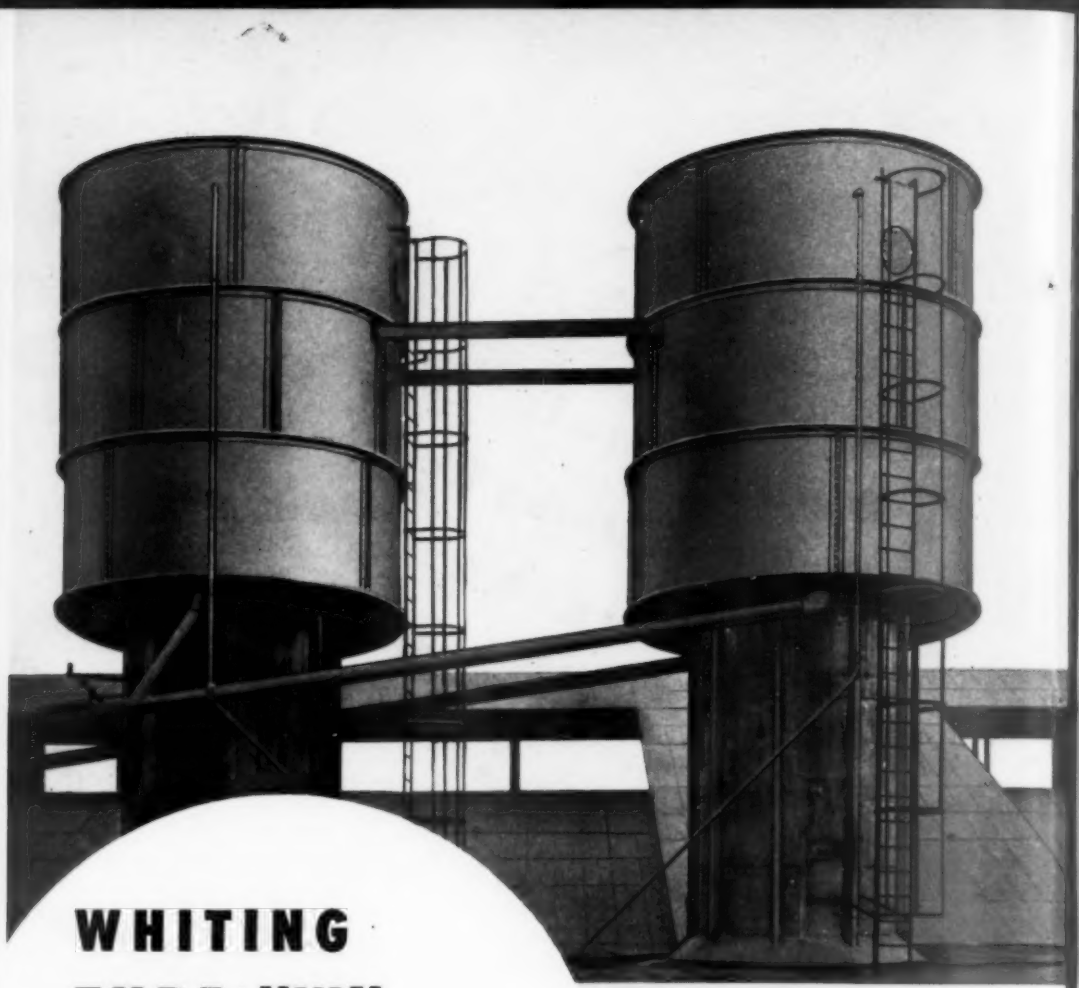


Diagram shows general arrangement of Type "W" Suppressor above cupola, and Stack Gas Oxidizer just above charging door.



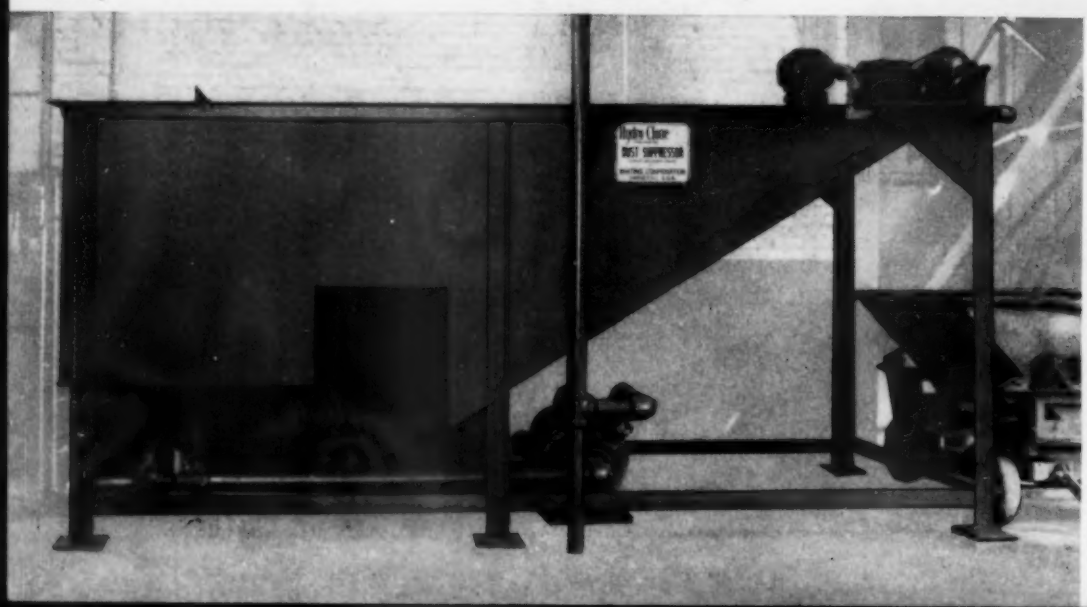
WHITING TYPE "W" HYDRO-CLONES

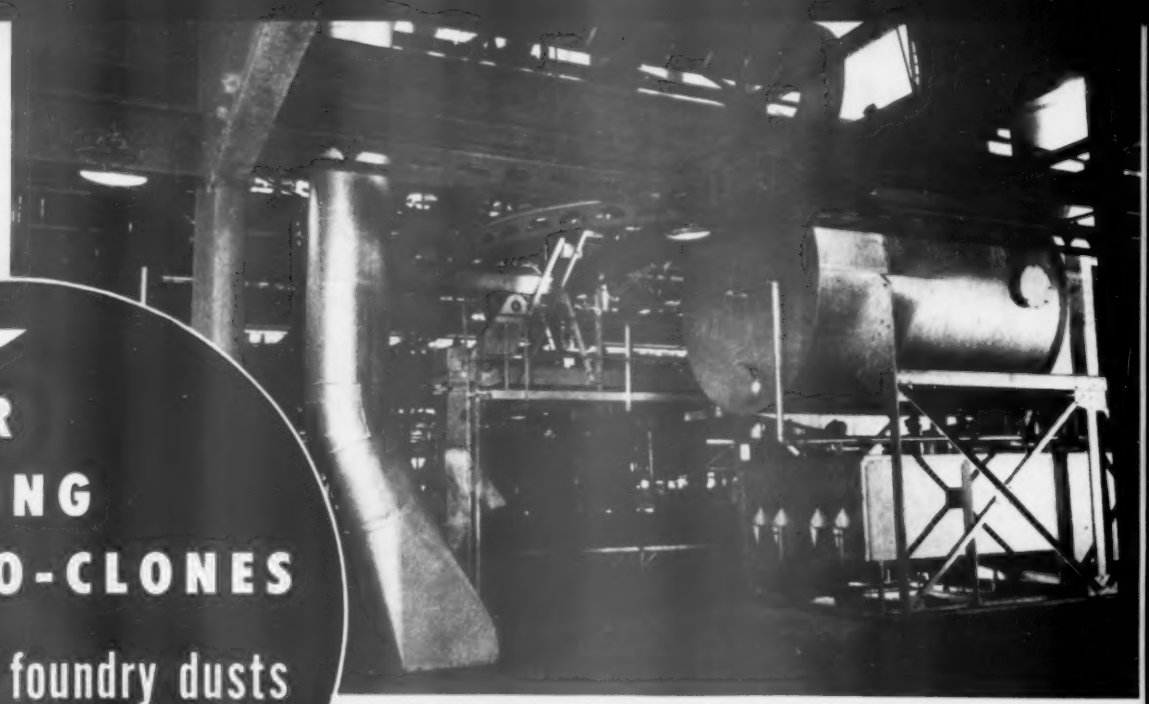
suppress dust and sparks from cupolas

Hydro-Clone Type "W" Dust and Spark Suppressors telescope over the cupola stack, and are supported by angle flanges and clips, making a rigid assembly. Used in conjunction with a Stack Gas Oxidizer and Flame Suppressor, the cupola discharge is reduced to a transparent or light-colored smoke which complies with rigid city ordinances and regulations.

Hydro-Clone Sludge Tank with automatic ejector is generally used for settling and disposal of sludge carried down from Type "W" Suppressor. Other methods of disposal are also used. Water can be recirculated after treatment to reduce acidity.

Stack Gas Oxidizer injects an atomized mixture of air and water into rising stack gases, oxidizing combustible substances and suppressing flames.

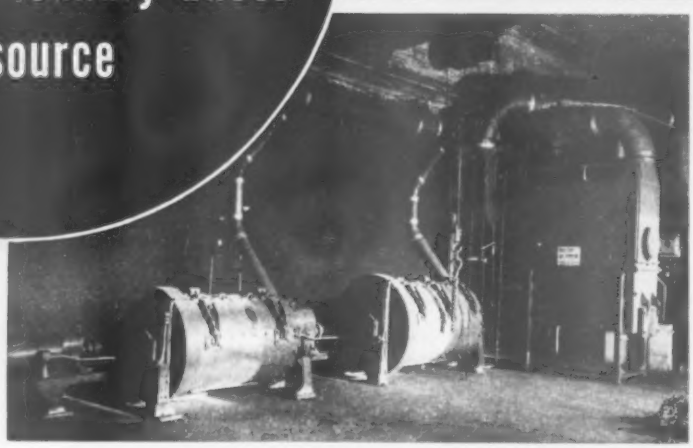




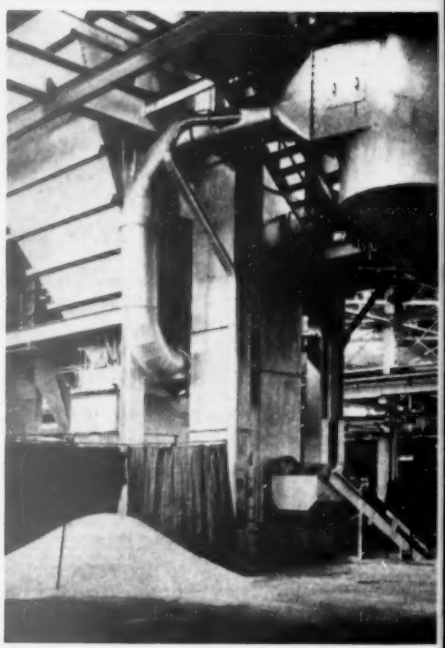
Exhaust pipe (left) carries dust from shake-out tunnel to Type "SHH" Hydro-Clone (right) where it is converted to harmless sludge.

OTHER WHITING HYDRO-CLONES

suppress foundry dusts at their source

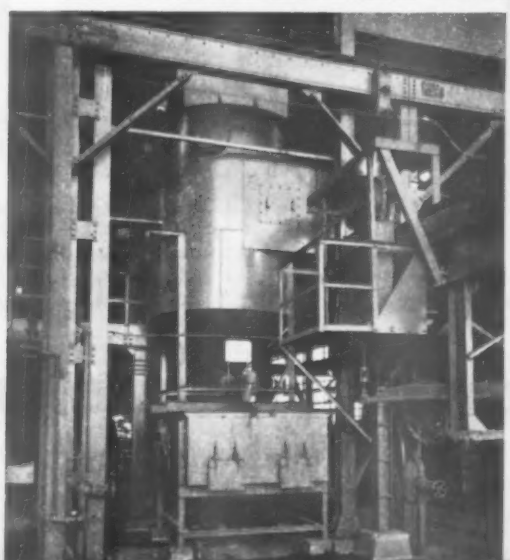


Type "R" Hydro-Clone directly connected with two Whiting Tumbling Mills.



Suspended Type "SH" Hydro-Clone used on sand-handling system, collecting dust at its source.

Dust and gases at flask breaking are drawn to side hood for disposal in Hydro-Clone Suppressor.

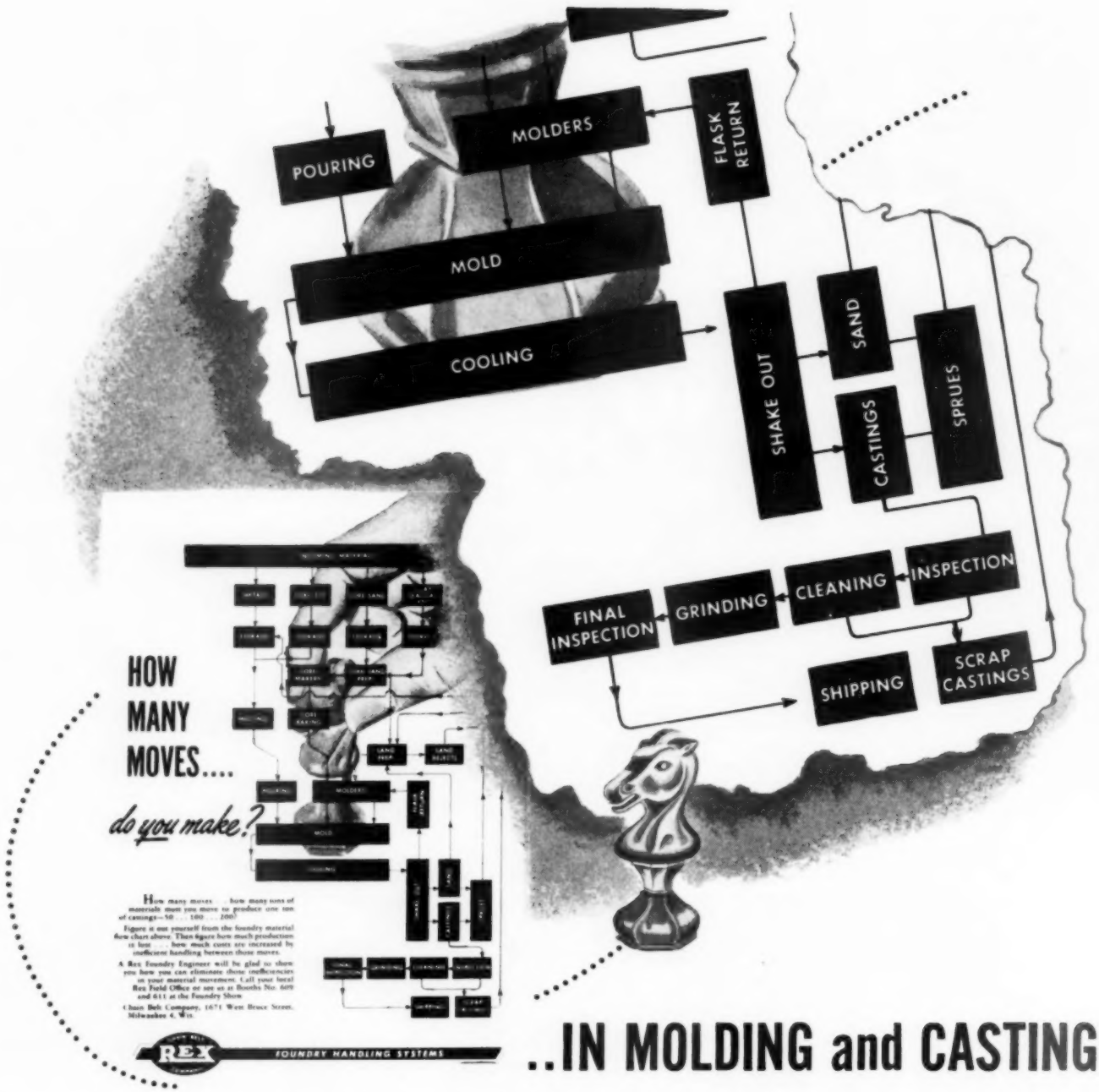


Type "SH" Hydro-Clone suppresses dust from around iron, coke and stone weigh hoppers.

WHITING
CORPORATION

15607 Lathrop Ave., Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church St., New York 7, N. Y.



..IN MOLDING and CASTING?

How many moves . . . how many tons of material must the average foundry move to produce one ton of castings in just the steps between pouring and shipping? For example:

METALS. Figuring an average of 1.3 tons of metal per ton of finished castings, you move 1.3 tons from ladle—to mold—to cooling—to shakeout for a total of 3.9 tons handled.

SAND. From molding station—to pour—to cooling—to shakeout—to preparation, you move 6 tons of sand four times. Total, 24 tons handled.

CORE SAND. From molding station—to pour—to cooling—to shakeout—to preparation, you move .5 tons of sand four times. Total, 2 tons handled.

FLASKS. From molding station—to pour—to cooling—to shakeout—to molding station, you move 1 ton four times. Total, 4 tons handled (not including boards and weights).

CASTINGS. From shakeout—to inspection—to cleaning—to grinding—to inspection—to shipping, to carrier, you move 1 ton 6 times. Total, 6 tons handled. (Not counting heat treatment).

SPRUES AND SCRAP. From shakeout—to inspection—to dump, you move .3 twice. Total, .6 tons handled.

TOTAL TONS. 40.5 tons handled to produce one ton of castings in just this phase of foundry operations.

A Rex Foundry Engineer will be glad to show you how a cost-reducing and efficient flow of materials can be achieved by use of a Rex Foundry System. Chain Belt Company, 1671 West Bruce Street, Milwaukee 4, Wis.

CHAIN BELT REX COMPANY — FOUNDRY HANDLING SYSTEMS

Stainless Steel is TOUGH

tough to cut, too—but LINDE makes the job easier . . . just as easy as cutting carbon steel

LINDE's powder-cutting process overcomes the barrier to fast and economical cutting of stainless or chromium steels.

By means of easily installed attachments for standard oxy-acetylene equipment, powder-cutting can be done without substantial change from carbon steel cutting techniques.

IN FOUNDRIES—

by powder-cutting, risers are removed 20 times faster than by older methods. Removal of riser pads and gouging out defects can be done at considerable savings in cost.

IN STEEL MILLS—

a 12,000-lb. ingot can be powder-scarfed in 4 to 6 hours—about 1/10 the time required for grinding. Sizing of ingots, billets, and slabs, removal of hot tops, scrapping operations, and many other cutting jobs can be done in a fraction of the time previously required.

IN FABRICATING PLANTS—

a stack of twelve 10-ga., type-304 stainless sheets were powder-cut at 8 in. per min. . . . 4-in. I.D. by 8-in. O.D. flanges on ½ in., type 316 plates were made in 2 minutes of cutting time apiece.

If you work with stainless steel you will want to know more about this LINDE process. LINDE can supply the equipment you need, help you to set up, and supply the training help you need.

Linde

The word "Linde" is a registered trade-mark of The Linde Air Products Company.

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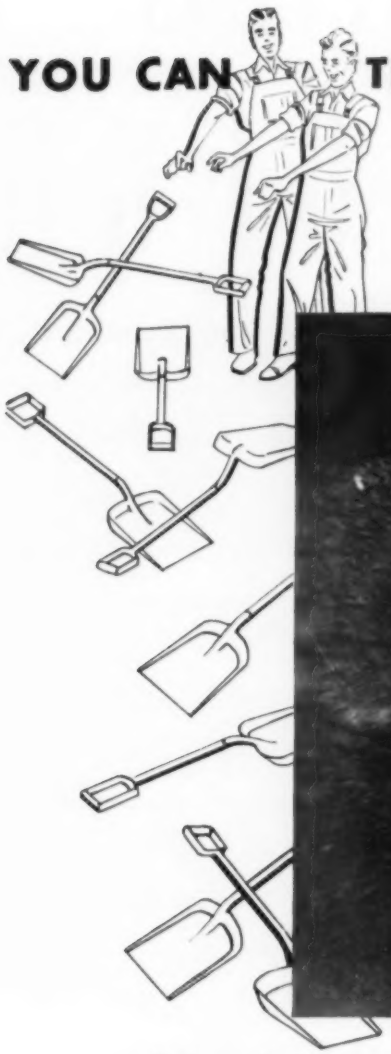
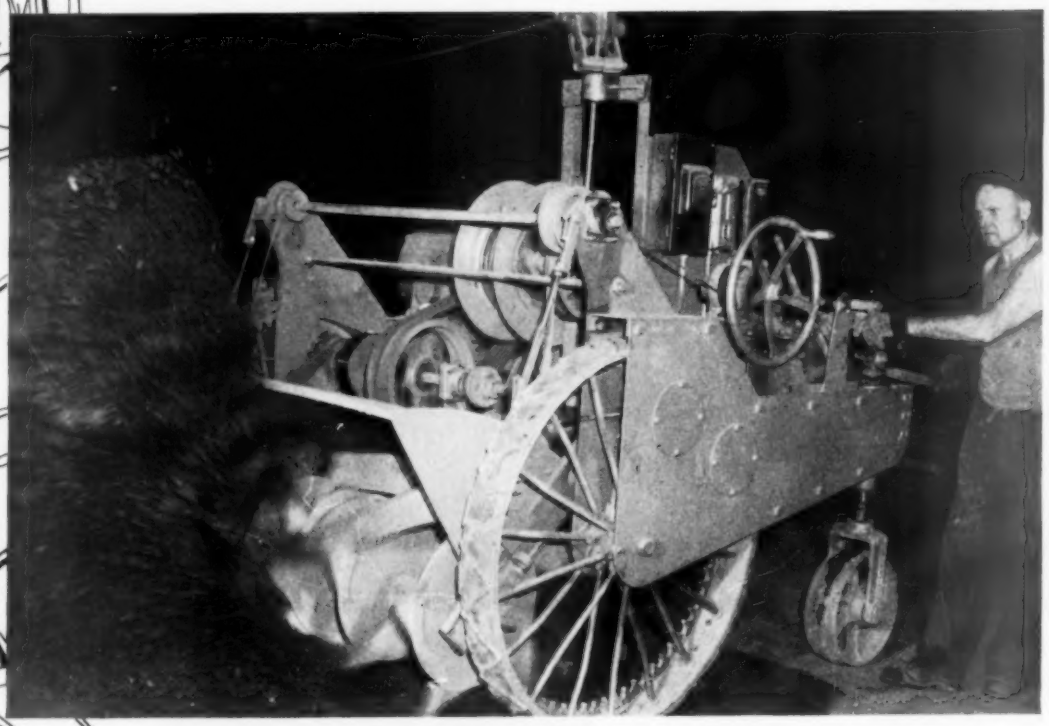
YOU CAN THROW AWAY YOUR "CRUTCHES"

when you have a SANDCUTTER





It is no longer necessary for foundry production to limp along on a shovel. The many limitations and the back-breaking work of conditioning sand by hand-shoveling belong with the past.

When the whirling, churning blades of the Sandcutter go into action, the sand is thoroughly mixed and aerated as it is thrown into the air and tossed from side to side, leaving it perfectly tempered . . . loose . . . soft . . . fluffy . . . and cool.

After the sand has been cut through, the entire heap can be piled beside the molding machine or between benches. This action, in moving the pile forward, gives the sand several additional cuttings.

The condition of sand cut with a Sandcutter is unexcelled. It can be prepared in accordance with individual requirements for moisture, bond and permeability. It riddles fast, rams easily and vents perfectly.

Join the many foundries that are "throwing away their crutches" and you, too, will be able to say:

"We are able to save about $18.00 per day in the cost of cutting our sand over the hand method".

"Our sand cutting cost compared with the hand method is about 33% less".

"If we had to go back to hand cutting, our costs would be increased by several thousand dollars a year".

Write for Complete Catalog

The "American Line" catalog illustrates and describes every Sandcutter model as well as all other American Products. Send for your free copy today.

American Sandcutters

AMERICAN WHEELABRATOR & EQUIPMENT CORP., 505 S. Byrkit St., Mishawaka 2, Ind.

JUST OFF THE PRESS!

THE NEW
RANSOHOFF BROCHURE

which illustrates and describes the most efficient methods for cleaning castings and sprue.

It's interesting, it's enlightening, it's informative and we sincerely believe every foundryman who is concerned with the cleaning of castings and sprue will find the new Ransohoff Brochure valuable and helpful.

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SMALL *or* LARGE . . . ONE *or* MANY—
MULTI-WASH COLLECTORS

FIT ANY FOUNDRY . . . CONTROL CONTAMINATION

SENIOR Multi-Wash Collectors . . . made in 1,500 to 30,000 CFM capacities and multiple units.

JUNIOR Multi-Wash Collectors . . . 1,000 to 30,000 CFM capacities and multiple units.

60 SIZES IN TWO MODELS

Profit from the experience of prominent foundry operators: *Multi-Wash Wet Method of eliminating foundry dust, gas and fumes from the air is unexcelled in effectiveness and in efficiency!* Multi-Wash was far in advance of conventional methods in 1921, when first built. Constant improvements in design, construction and application keep it far in advance today. *And there's a size to fit your need!*

SCHNEIBLE Multi-Wash Collector Towers have no moving parts to wear, burn or freeze, require no maintenance, can be installed and practically forgotten. They conserve floor space because they can be installed in building lantern or outdoors instead of on floor. They improve working conditions and promote a better community spirit.

We've made hundreds of successful applications, including special designs and arrangements to cope with unusual conditions. Write today for further data and information.

CLAUDE B. SCHNEIBLE COMPANY

2827 Twenty-Fifth St. • Detroit 16, Michigan

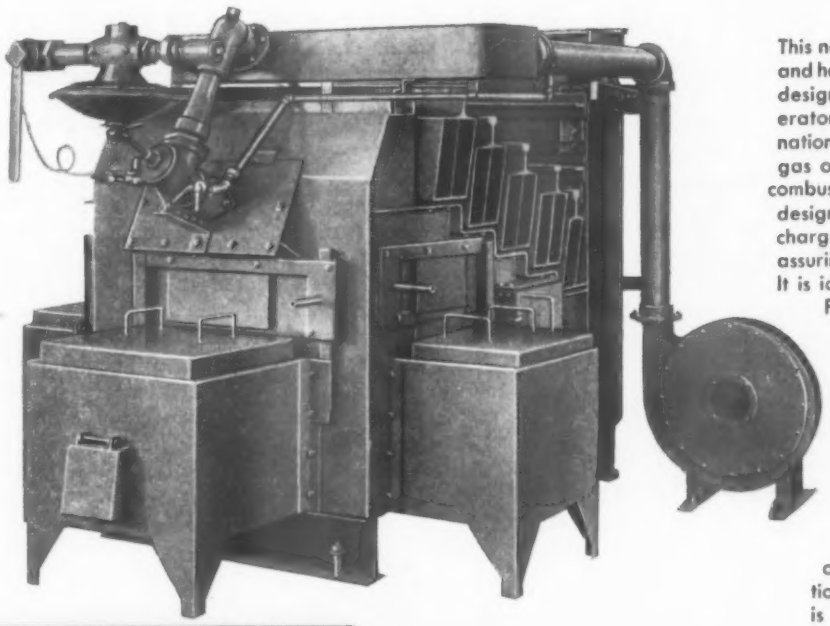
U.S. and Foreign Patents Pending

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

SCHNEIBLE

ATTENTION ALUMINUM MELTERS!

Here's the NEW Stroman Model MC Aluminum Reverberatory Dip-Out Furnace



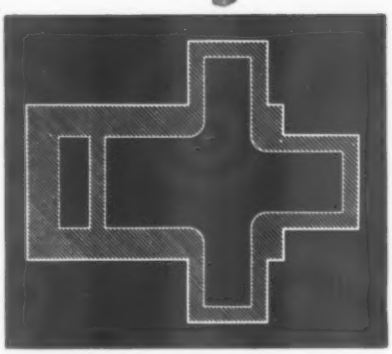
This newest of Stroman Furnaces is a combination of breakdown and holding furnaces. It's two in one ... and the most economic ever designed for aluminum melting. The MC Furnace is of the reverberatory type. It can be fired by either gas or oil or with combination burners, so that it is a simple matter to switch from oil to gas or vice-versa. Fuel costs are reduced to unheard of lows, combustion which is generally exhausted in ordinary furnace designs, is used in this furnace to pre-heat and melt the metal charge. No cold metal reaches the bath of molten aluminum, assuring fastest melting and uniform temperature of bath.

It is ideal for Die Casting, Permanent Mold and Sand Casting Plants. It is the zenith of speedy, efficient operation. Hot metal is ALWAYS available for dipping. Built to accommodate 500 to 4000 lbs. metal bath, the dip-out boxes are placed around the furnace so that three to six die casting or permanent mold stations may be easily operated with a single MC Furnace.

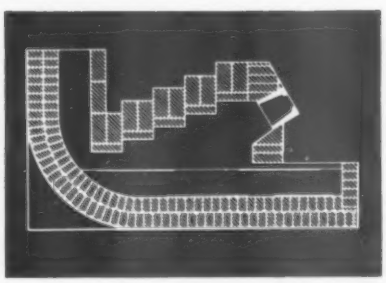
The Model MC brings "Good Housekeeping" to your plant. For returns, gates, risers, may be immemediately returned to the hopper with the ingot ... Creates Ideal Working Conditions, for furnace radiates very little heat ... Lowest Maintenance, no iron pots or crucibles to replace, no breakdowns ... Minimum formation of dross ... Finest quality castings, every time ... Furnace is delivered as complete unit, ready to melt. Complete Automatic Controls available if desired.

Compare floor space required for one Stroman Model MC to three breakdown and three holding furnaces to supply the same amount of molten metal. A tremendous saving in square feet, as well as man hours and metal saved in transfering from breakdown to holding.

Cut your aluminum melting costs to the bone ... Let Stroman Engineers show you how this great production furnace will fit into your plant and boost profits to new highs. Write today for full information and specification. Do it NOW.

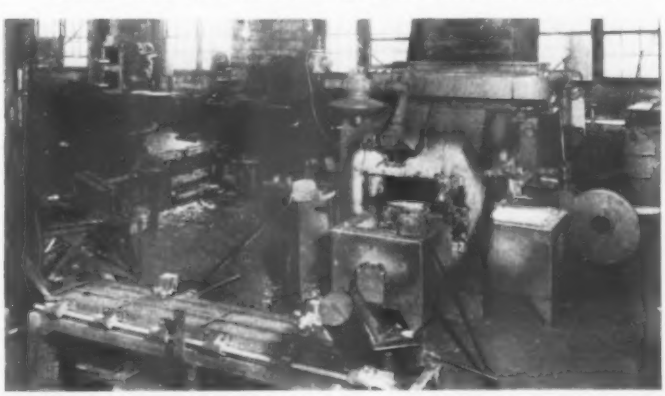


Horizontal View Showing 3 Dip-Out Boxes

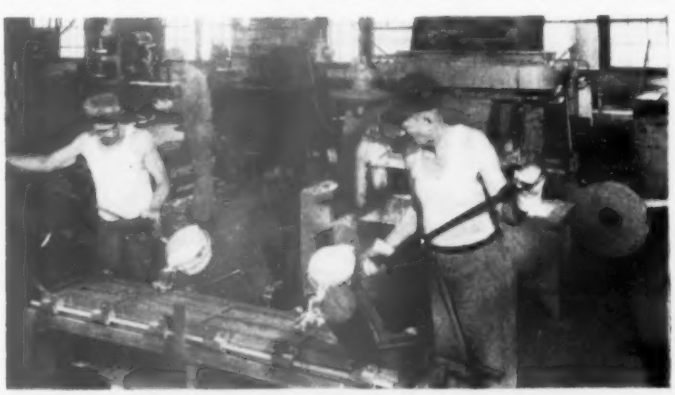


Vertical View Showing Combustion Chamber, Metal Bath and Charging Hopper.

Stroman Model MC Furnace illustrated has a 3000 lb. Metal Bath.



Small floor space still allows up to six men to work with ample elbow room.



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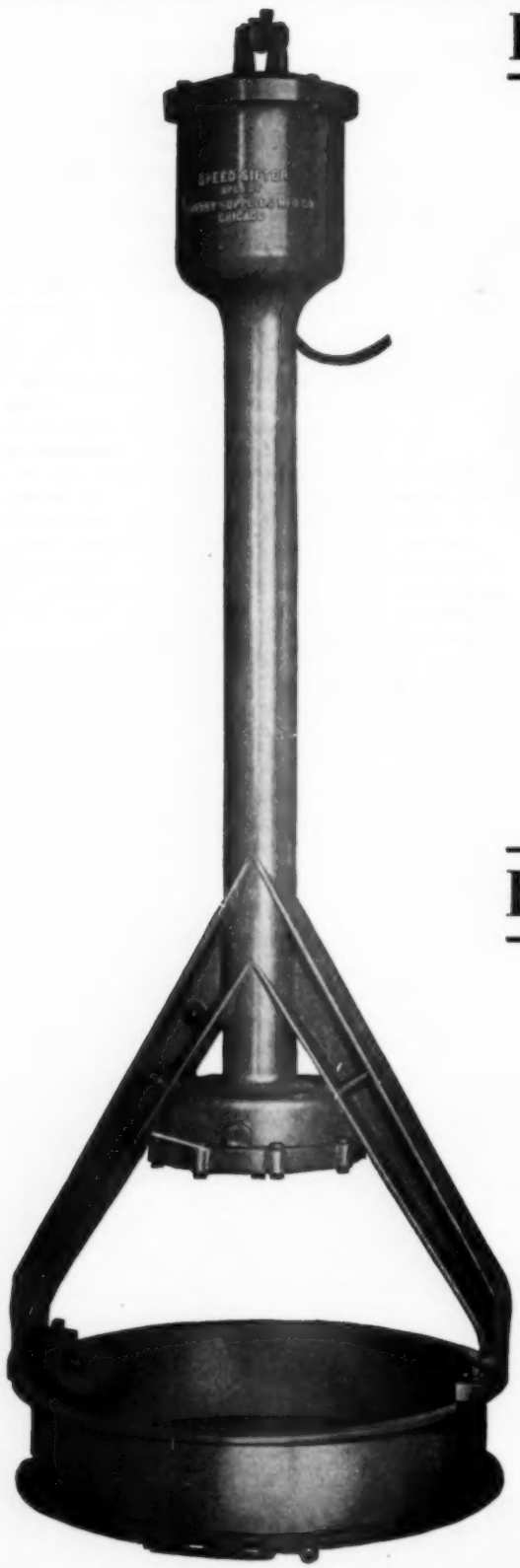
Increase Production

with the

ROTOPLANE SPEED SIFTER ★ RED ELECTRIC VIBRATORS



ROTOPLANE SPEED SIFTER

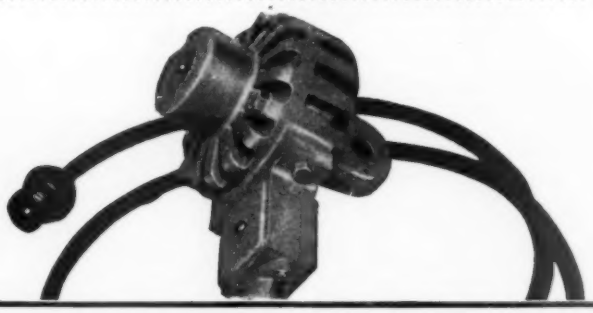
The ROTOPLANE Speed Sifter is an *improved* sand riddle of much greater capacity and much longer life. One size and type serves all purposes in the foundry—does *all* your sifting more quickly and economically.

It is easily handled by one man, weighs approx. 90 lbs., is 62 in. high overall. The one-piece frame of tough aluminum alloy makes for a remarkably effective vibration. Its smooth, free, rotary action vastly increases bearing life; all bearings grease packed. All mechanism of the ROTOPLANE is *completely* enclosed—no bearings or activating parts of any kind exposed to dust and grit.

The Quick-Change Sieves are instantly interchangeable, mounted in smooth, flat steel ferrule, with 20-inch diameter clear sifting area. No jagged edges to tear workers' hands, no storage problem.

$245.00 f.o.b. Chicago—complete with cable, safety ground wire. Standard 1/3 h. p. motor, 110 volt, 60 cycle, single phase and 220 volt, 1 or 3 phase.

UNIVERSAL FREE - WHEELING RIDDLE equipped with motor as above $225.00



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True-to-pattern castings make satisfied customers . . . more repeat business. Increase your production and castings quality with RED Electric Vibrators. Sturdy, dustproof, lowest operating cost (electricity does not freeze). Unequaled for consistent year-'round results in foundries all over the world.

(All Prices f.o.b. Chicago)

No. 1—Light match plate work	$12.00
No. 2—Medium match plate work	15.60
No. 5—Heavy match plate, tub and bench work	20.40
No. 9—Machine and heavier work	28.80

Third (ground) wire per U. S. Govt. code—furnished with No. 9 at no extra cost; $1.20 extra with Nos. 1, 2 and 5 vibrators.

KNEE SWITCHES for operating Red Electric Vibrators: Single pole $5.00, Double pole $6.50.

FOUNDRY SUPPLIES MANUFACTURING CO.

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HOW TO

- Get Quicker, Cleaner Parting
- Produce Smoother Castings
- Reduce Foundry Smoke

Whether you cast in sand, permanent molds or dies, **"dag"** colloidal graphite can help you.

Chill coating materials made with **"dag"** colloidal graphite dispersions form dry films of graphite that resist oxidation, minimize gas pockets and permit easy removal of the chill.

When sprayed or brushed on patterns, dies and permanent molds, **"dag"** dispersions form a micro-thin film that insures rapid, clean parting and smooth casting surfaces. The coating is so thin that castings are kept to close tolerances.

Whatever the casting temperature, you will reduce or eliminate choking fumes and smoke by using aqueous **"dag"** dispersions . . . a break for the men in the shop. **"dag"** colloidal graphite also eliminates binding and stripping when applied to screw threads, flask pins, etc.

To get more information fill out the coupon and mail TODAY.

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MODERN machines snap up the flow of new "Wheels of Industry" along Sterling's production lines. Many of these machines have been designed by Sterling technicians. Only Sterling customers can benefit from their use. The resulting accelerated speed of manufacture is in keeping with the aims of Sterling's New Research and Development Program which is dedicated to the production of better grinding wheels, delivered in less time.

This program, planned for years, now offers you unusually high-grade grinding wheel quality and performance. The creation and testing of "tailor-made" wheels and their application to your specific grinding problems is building unusual demand throughout industry for Sterling Abrasives and proving their dependability.

There is "something extra" in Sterling Grinding Wheels. Sterling engineers will gladly tell you why their use in your plant will result in faster, better, more economical production. Write or wire today!

STERLING RESEARCH AND DEVELOPMENT IN ACTION

FIRST STEP The foreman of a surface grinding department, finding himself with a problem of production, calls in the Sterling engineer.

SECOND STEP The Sterling engineer demonstrates why Sterling's patented segments, with their special shape, grain, and bond will do an expert job.

THIRD STEP Back in the Sterling laboratory, a sample segment, built to the special surfacing job's demands, is created and thoroughly tested.

FOURTH STEP On the job, Sterling segments fortified by the unusually high standards of the new research program, meet all production demands.

THE STERLING GRINDING WHEEL DIVISION
of
THE CLEVELAND QUARRIES CO.
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Since 1885, Manufacturers of "The Wheels of Industry"

Branches: Boston, Chicago, Cleveland, Detroit, Los Angeles, Philadelphia, New York. Distributors In All Cities.

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STERLING'S
PRODUCTION DEVELOPMENT TECHNIQUE

Built to the special demands of greater production, the above siding machine automatically speeds up the flow of your "Wheels of Industry" by handling them much faster than ordinarily-used methods.

"THE WHEELS OF INDUSTRY"
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AO
R-9100
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Respirators

Positive, Comfortable, Economical

Protection Against Dusts

When workers are exposed to pneumoconiosis-producing and nuisance dusts, the R-9100 is the respirator to select for protection... when toxic dusts must be guarded against, the R-9100T is the choice. Both respirators are similar in construction—ribbed to provide maximum filtering area, reinforced with wire to preserve shape. BOTH MODELS CARRY THE APPROVAL OF THE U.S. BUREAU OF MINES. Order from your nearest AO Safety Products Representative.

FEATURES: Light weight (less than 2 ounces) • Comfortable under helmets or with goggles • Easily adjustable double headbands • Fit any face snugly, comfortably—men's or women's • Easily replaceable, non-reversing exhalation valve • Quickly cleaned—just shake or blast with an air-hose.

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CASTFLUX

The "National" Dual Purpose Flux

Increases Foundry Efficiency — Drastically Reduces Casting Costs Helps You Meet Today's Highly Competitive Market!

"Hit and Miss" production is the sure road to loss.

More especially today when competitive conditions require the most advanced and practical manufacturing procedure.

Castflux is a must in your foundry operations because it cuts losses, and speeds up production.

CASTFLUX
Trade Mark Reg.

does this because it . . .

Degasifies and deoxidizes iron in ladles.

Increases fluidity by eliminating oxides, foreign material and gases.

Aids machinability by producing cleaner more closely grained castings.

Helps keep ladles cleaner with longer life to lining.

Holds iron or steel molten and in condition longer when ladle pour must be held up for any reason.

And Castflux does all this at a cost of only 10¢ to 15¢ per ton of metal treated

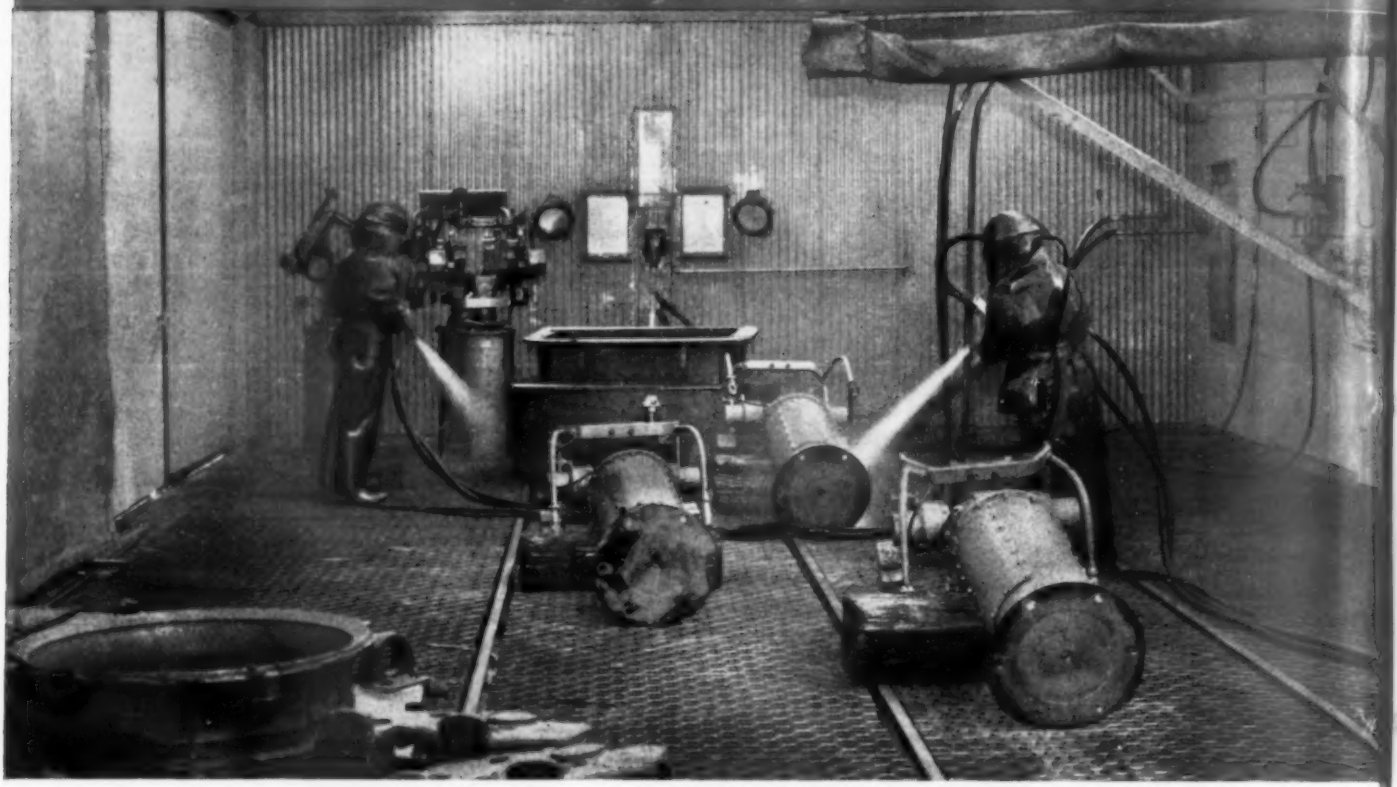
ON BOTH BLIND and OPEN RISERS

Castflux raises the temperature of the metal to a higher degree and substantially increases and maintains the fluidity of the metal during the entire cooling-down period.

NATIONAL

PIGMENT COMPANY
2115-2117 EAST YORK STREET
Philadelphia 25, Pa., U. S. A.

Philadelphia Navy Yard Cleans Castings



Two guns in operation in the Hydro-Blast enclosure. At the far end, center, is the turn-table for large, heavy castings; and behind it is a Hydro-Blast high-gallonage gun controlled from outside.

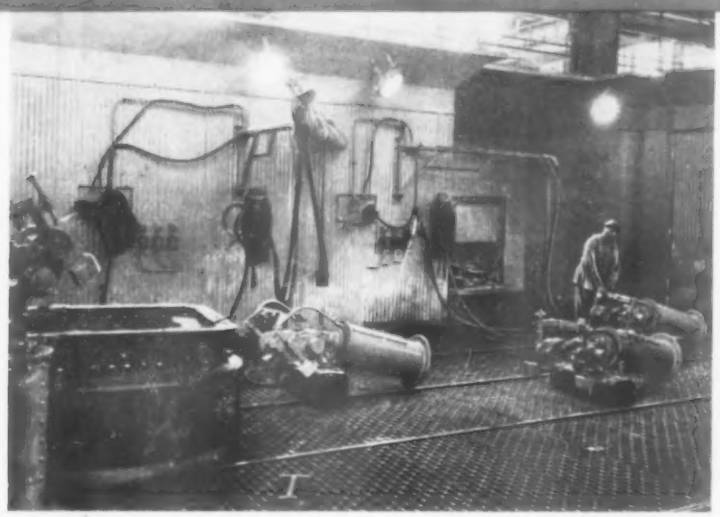
◀ Operator directs high-gallonage Hydro-Blast gun from outside the enclosure, at castings on a turn-table. The foot-lever controls an air hoist which raises and lowers the swivel-mounted gun.

An auxiliary turn-table half inside and half outside the enclosure, with a dividing partition. While castings on the inner half are being cleaned by the Hydro-Blast, the outer half is being loaded. ▶

HYDRO-B

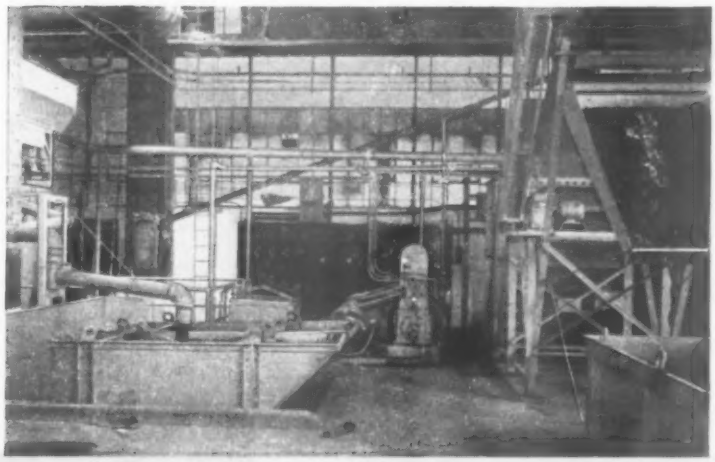
2550 NORTH WESTERN AVE. CH

with HYDRO-BLAST



▲ At the left, the turn-table for heavy castings, and the higher-gallonage gun controlled from outside the enclosure. At the right is the auxiliary turn-table for smaller castings.

Shown below are the sand classifier at the upper left, and sand dewatering boxes in the left foreground; in the center, high pressure pumps with motors, and panel board in the rear; ▼ at the right, sludge disposal equipment.



Castings are cleaned a great deal faster and at much lower cost at the Philadelphia Yard since the installation of the Hydro-Blast method. In addition, the Hydro-Blast has proved to be an effective means of reducing dust in the foundry air.

These same benefits—cleaning castings faster, cleaner air and good, clean savings—can be yours, through using a Hydro-Blast installation designed to meet your individual requirements. It costs nothing to investigate—and may be costing you a good deal not to. It's time well invested to talk about it with Hydro-Blast engineers.

-BLAST CORPORATION

E. CHICAGO 47, ILLINOIS

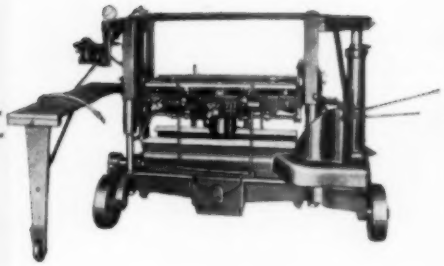
FOREIGN REPRESENTATIVES

England, Norway, Sweden, Denmark and Finland — Pneulec Limited, Licensee, Smethwick (near Birmingham) England

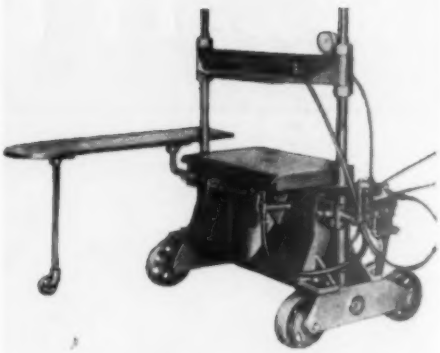
France and Switzerland—R. Dureuil, 4 Square Du Graisivaudan, Paris 17, France

Belgium—Charles Monseur, 195 Rue Saint Leonard, Liege, Belgium

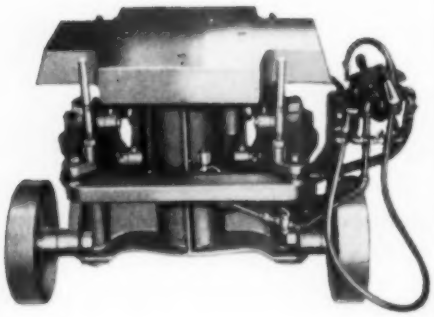
Jolt Squeezer—Arm type
5 sizes



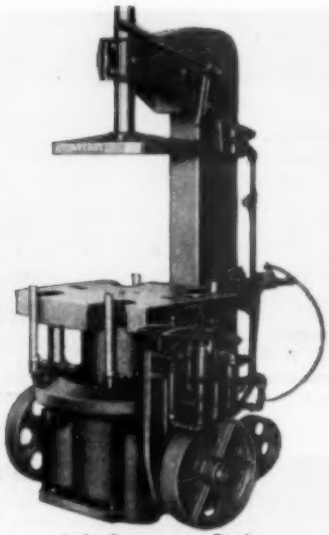
Jolt Rollover Squeeze Draw
4 sizes



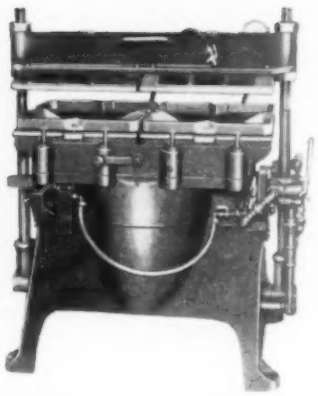
Jolt Squeezer—Strain rod type
2 sizes



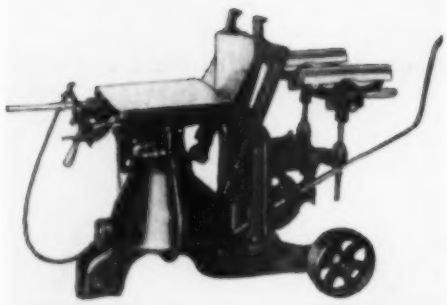
Jolt Pin Lift
3 sizes



Jolt Squeeze Strip
4 sizes



Multiple Molding
3 sizes



Jolt Rollover Draw
3 sizes

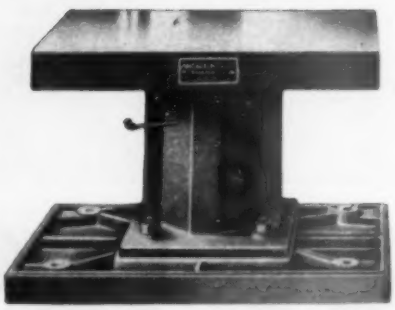
8 Good Ways to
CUT MOLDING COSTS

Here's a molding crew that knows its business—these eight veteran shock troopers proved in the incessant war against lagging production and climbing costs.

You can expect "good news for foundries" regularly from Arcade. Meanwhile send for bulletins.

ARCADE

MANUFACTURING DIVISION
ROCKWELL MANUFACTURING CO.
FREEPORT, ILLINOIS



Plain Jolt
6 sizes

Interest in Technical Developments Is High

THE recent annual convention of the American Foundrymen's Society in St. Louis should be recorded as a most successful technical meeting. While general business conditions in the industry and possibly other factors held the registered attendance somewhat below the record established for conventions staged without exhibits, interest displayed in various phases of the program was exceptionally high. Attendance at most of the technical meetings, round tables and shop courses set new records.

The high point in interest was reached on Tuesday afternoon when 800 foundrymen filled the ballroom of the Jefferson Hotel for a two-hour program on nodular and spheroidal graphite cast irons. A panel discussion by four speakers and brief talks by a number of interested foundrymen brought forth little in the way of new information, but did emphasize a definite divergence of opinion on the part of the experts, and a confused patent situation. Attendance at the session accurately reflects the fact that introduction of nodular and spheroidal irons has produced greater interest among ferrous foundrymen and casting users than any foundry development during the past quarter century.

Officers, directors and the executive staff of the society should find much satisfaction in the success of the St. Louis convention and the other work of the organization. During the past year the Board of Directors has wrestled with a number of pressing problems, and numerous decisions have been made which may have considerable influence on the future trend of the society. While time will be needed to evaluate some of these actions, the willingness of the board to move into these problems should be appreciated by the society membership.

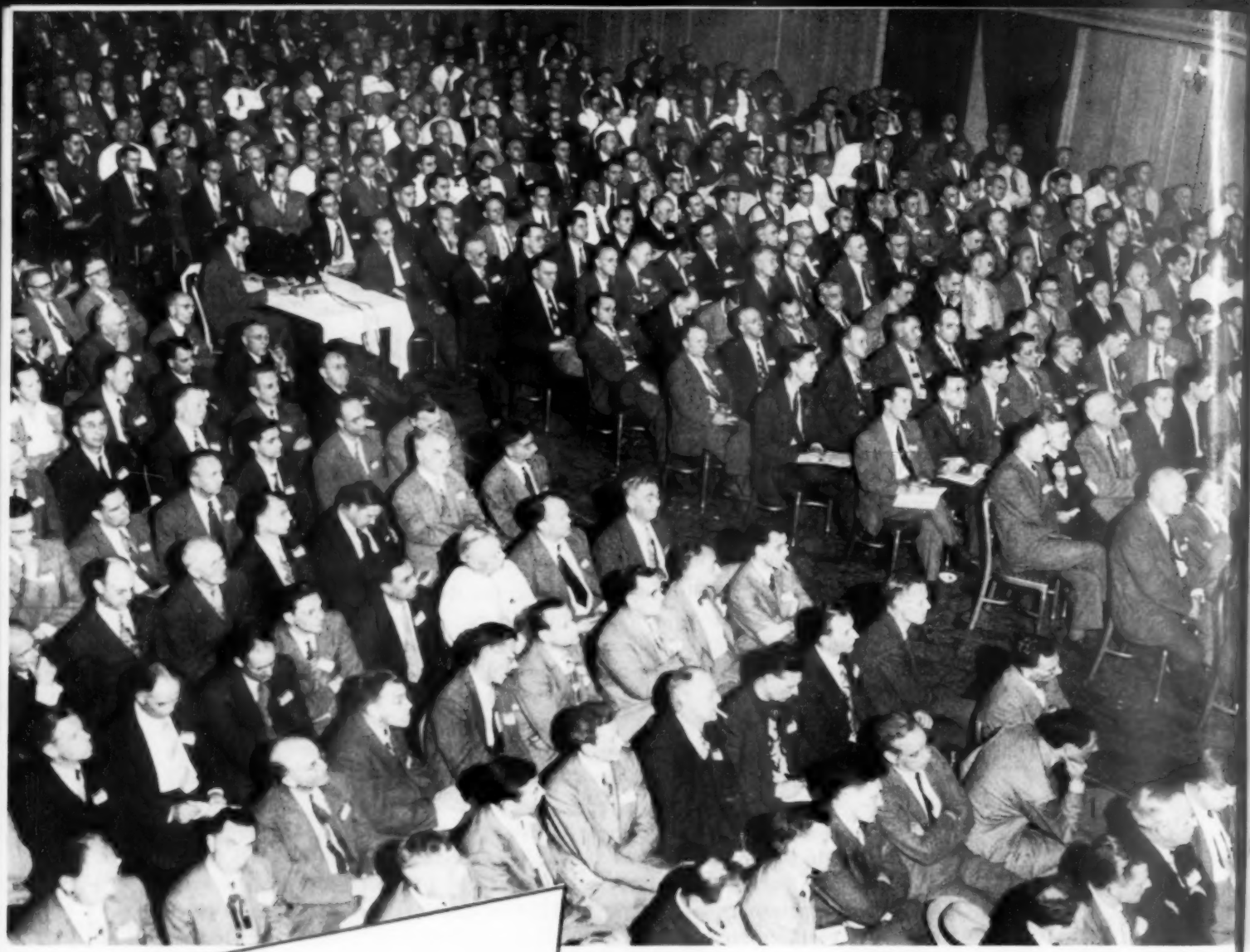
In any discussion of the year's activities, a special word of praise should go to William B. Wallis, retiring president, for carrying through his self-imposed program of visiting all of the AFS chapters during his term of office. Undoubtedly the officers and directors of all chapters feel closer to the society and have a better understanding of its problems because Bill Wallis made these visits.

Selection of Cleveland for the 1950 convention and exhibition should meet with general approval. Many exhibitors have indicated a preference for Cleveland shows, and foundrymen find the city conveniently located in the center of the heaviest concentration of foundry capacity.

Incoming President Edwin W. Horlebein can look forward to a year of further progress in AFS activities, climaxed by an outstanding meeting in Cleveland, May 8 to 12, 1950.

Frank G. Steinebach
Editor

THE FOUNDRY — WHEREVER METALS ARE CAST



TECHNICAL DEVELOPMENTS HIGHLIGHT AFS Convention

ANNUAL convention of the American Foundrymen's Society at St. Louis, May 2 to 5, demonstrated the active interest of foundrymen in developments affecting the production and application of castings. The comprehensive program of technical papers, discussion and motion pictures was presented in practically all instances to large audiences—in some cases to overflowing crowds.

Outstanding instance from the standpoint of attendance was the session devoted to discussion of nodular iron which filled Hotel Jefferson's ballroom with more than 800 intent listeners. Unusually large attendances also marked the luncheon meeting at which the Aluminum and Magnesium Division's research committee report on gating design was presented, and the annual roundtable luncheon of the Brass and Bronze Division.

Total attendance at the convention of approximately 2500 naturally was off from the registrations at meetings during which the biennial exhibit of foundry equipment and supplies also has been held. This exhibit will be conducted again in 1950 when the ASF returns to Cleveland, May 8 to 12, for its 54th convention, as announced by President William B. Wallis at the annual banquet in St. Louis.

Fig. 1—Part of the capacity audience which attended the session devoted to discussion of nodular iron
Fig. 2—William B. Wallis, AFS president, speaking at the society's annual business meeting

Nontechnical features of the 53rd convention included the annual business meeting of the society, the Alumni Group and Canadian dinners, the chapter officers and directors luncheon, and the annual banquet with its presentation of awards to seven outstanding foundrymen for service to the society and industry. At the annual business meeting Edwin W. Horlebein, president and general manager, Gibson & Kirk Co., Baltimore, was elected president of the AFS, to take office immediately after the annual meeting of the board of directors this summer. Mr. Horlebein, currently serving as vice president, will be succeeded in that capacity by Walton L. Woody, vice president, National Malleable & Steel Castings Co., Cleveland.

Mr. Wallis, retiring president, will continue as a director of the society for one year, and five new directors were elected for three-year terms. They are: Thomas E. Eagan, chief metallurgist, Cooper-Bessemer Corp., Grove City, Pa.; Lloyd C. Farquhar, works manager, American Steel Foundries, East St.

EDWIN W. HORLEBEIN
President-elect

WALTON L. WOODY
Vice President-elect

AFS Convention

Louis, Ill.; Vincent J. Sedlon, president, Master Pattern Co., Cleveland; Fred G. Sefing, research metallurgist, International Nickel Co., New York; L. D. Wright, superintendent, U. S. Radiator Co., Geneva, N. Y. Biographies of the new officers and directors are presented in this issue, starting on p. 150.

In presiding at the annual business meeting President Wallis paid tribute to the society's chapter officers for their efforts in promoting the growth and activities of the organization as a whole. He touched on various AFS functions, including research and educational projects, and urged that the foundry industry funnel its research expenditures through the organized channels which have been provided by the society. Mr. Wallis also recommended that increased attention be given to safety and hygiene problems. Educational activities were elaborated on further by Fred G. Sefing, chairman the last two years of the AFS Educational Division, who indicated that the job of interesting and training young men in the foundry industry necessarily must be a long-range program.

Fig. 3—Donald J. Reese, International Nickel Co., addressing the nodular iron session

Fig. 4 — John Howe Hall delivering the Charles Edgar Hoyt Annual Lecture

Fig. 5—C. R. Culling, extreme right, Carondelet Foundry Co., chairman of St. Louis Chapter's general arrangements committee for the convention, shown with, left to right: W. R. Bean, Staunton, Va., former vice president, Whiting Corp.; Frank G. Steinebach, *The Foundry*; D. E. Krause, Gray Iron Research Institute, and Lt. Col. Frank H. Holmes, Munitions Board, Washington

College-level training, as initiated by the Foundry Educational Foundation, likewise should be permanent, he added.

William W. Maloney, national AFS secretary-treasurer, reported on the 1949 national apprentice contest, which attracted 71 entries. Winners in the various classifications were announced, as follows:

Gray Iron — First prize, William C. Oliver Jr., Caterpillar Tractor Co., Peoria, Ill.; second prize, Chester Konopinski, Fulton Foundry & Machine Co., Cleveland; third prize, Thomas Conrad, Fulton Foundry & Machine Co., Cleveland.

Steel—First prize, Raymond S. Lipowski, Bucyrus-Erie Co., South Milwaukee, Wis.; second prize, Elmer E. Hollibaugh, General Metals Corp., Oakland, Calif.; third prize, Robert Conner, Continental Foundry & Machine Co., East Chicago, Ind.

Nonferrous—First prize, Elmer J. Turk, Wellman Bronze & Aluminum Co., Cleveland; Donald Inman, Western Aluminum Match Plate Corp., Cleveland; third prize, Edmund J. Skowronski, Ampco Metal Inc., Milwaukee.

Patternmaking—First prize, John William Burkholder Jr., Central Pattern Co., St. Louis; second prize, Donald A. Siebert, Royal Pattern Works, Cleveland; third prize, Harlan A. Killian, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

The four first-prize apprentices were guests of the society at the convention to receive their cash awards from President Wallis.

Immediately following the business meeting John Howe Hall, consultant, Swarthmore, Pa., was introduced by President Wallis to present the Charles Edgar Hoyt Annual Lecture. Mr. Hall's paper, entitled "Steel Castings in Welded Assemblies," com-

Fig. 6 — AFS apprentice contest winners, left to right: R. S. Lipowski, Bucyrus-Erie Co. Milwaukee; E. J. Turk, Wellman Bronze & Aluminum Co., Cleveland; J. W. Burkholder Jr., Central Pattern Co., St. Louis; W. C. Oliver Jr., Caterpiller Tractor Co., Peoria, Ill.

Fig. 7—Many "Old Timers" registered at a special booth. Shown left to right are John Grennan, University of Michigan; E. C. Zirzow, Deere & Co., Moline, Ill.; D. E. Clifford, Hickman, Williams & Co., Chicago

Fig. 8—Speakers' platform at the annual business meeting

prised an exceptionally detailed review of developments—particularly during the last 15 years—in combined use of castings and rolled or forged steel to fabricate a variety of products.

The speaker traced some of the earlier history of welding applications both for the repair of steel castings and for the fabrication of parts from rolled steel. In the early days the manufacture of welded rolled steel assemblies to replace cast parts was overdone, he indicated. Later experience has demonstrated the obvious advantage in many instances of combining castings with rolled steel by welding. Slides were shown of such examples, which included parts involving a combination of thin and heavy sections; assemblies of large, flat areas with complicated sections, and parts which are too large to ship if cast in one piece.

In conclusion, Mr. Hall pointed out that consumers are seeking maximum serviceability at lowest cost, and since this frequently can be provided by assemblies of rolled and cast steel, it is advisable for foundries to think in terms of selling a product rather than merely a process.

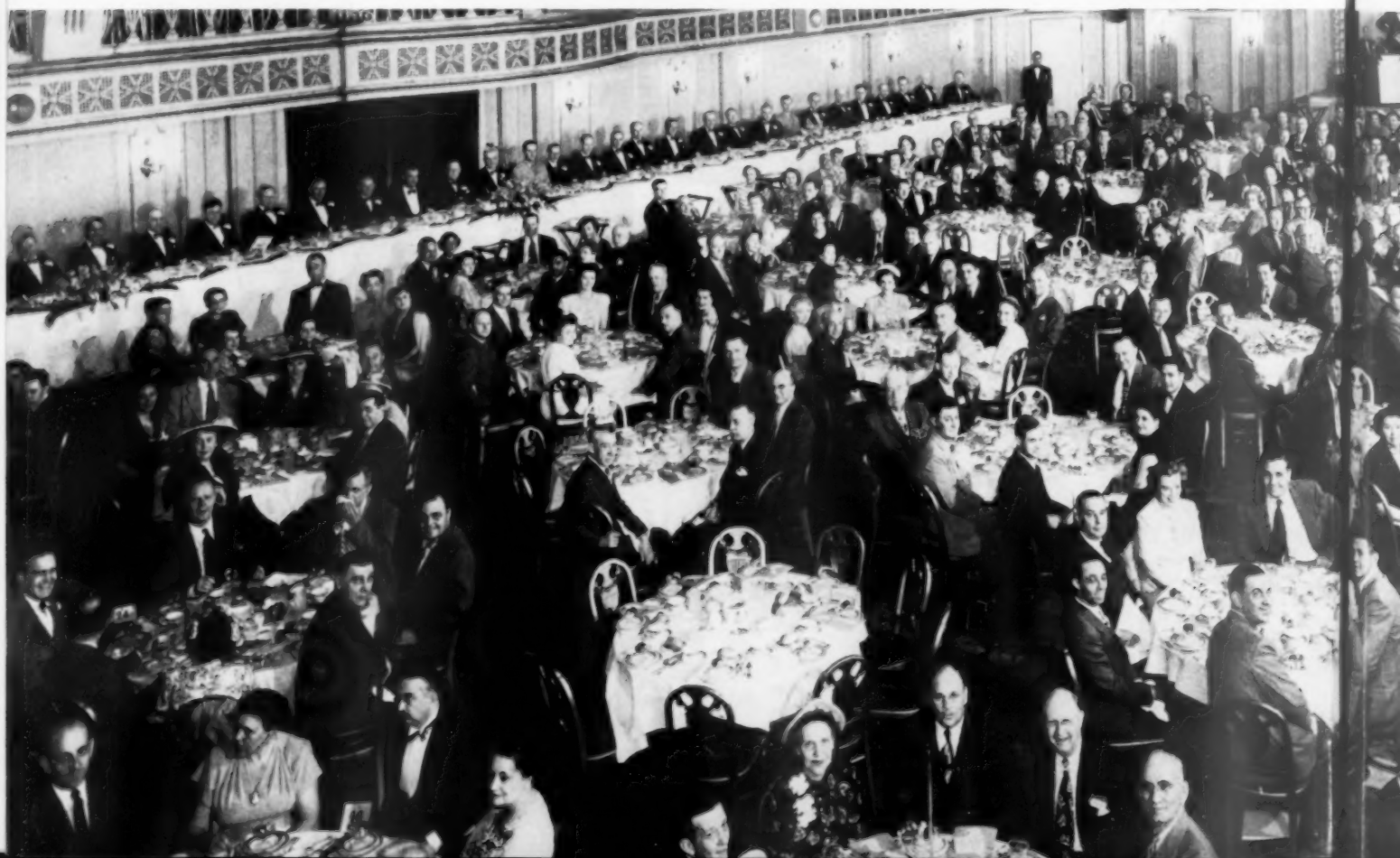
Mr. Wallis presided at the annual banquet concluding the convention, and Herbert S. Simpson, National Engineering Co., acted for the AFS Board of Awards in presiding over the presentation of gold medals and honorary life memberships. Gosta Vennerholm, Ford Motor Co., Dearborn, Mich., received the William H. McFadden Gold Metal from Fred J. Walls, International Nickel Co., Detroit. Russell J. Anderson, Belle City Malleable Iron Co., Racine, Wis., was recipient of the Peter L. Simpson Gold Medal, the presentation being made by Sheldon V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis. S. C. Massari, technical director of AFS, was presented the John H. Whiting Gold Medal by Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.

AFS Convention

L. D. WRIGHT

Four life memberships in the society were awarded —to Anthony Haswell, Dayton Malleable Iron Co., Dayton, O., by Ralph J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich.; to Ralph L. Lee, Grede Foundries Inc., Milwaukee, by C. R. Culling, Carondelet Foundry Co., St. Louis; to Clement J. Freund, University of Detroit, by Harold Falk, Falk Corp., Milwaukee, and to William B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, by Mr. Simpson.

Guest speaker at the banquet was W. Stuart Symington, secretary of the Air Force. Mr. Symington



L. C. FARQUHAR

F. G. SEFING

T. E. EAGAN

V. J. SEDLON

discussed briefly the three functions of the Air Force —defense, offense, and tactical support of the Army and Navy—as well as the work in developing safer and faster planes. Concerning possible savings in expenditures on defense, he declared that proposed changes in the Unification Act of 1947 would result in a saving of billions of dollars in the total military budget.

The annual dinner of the Alumni Group, which includes past and present officers and directors, medalists and honorary life members, was held at the Missouri Athletic Club on Wednesday evening. Past President Max Kuniansky presided, and an excellent and inspiring talk was made by Dr. Kenneth McFarland, superintendent of schools, Topeka, Kans. C. E. Hoyt, secretary of the group, got a great deal of satisfaction out of the large attendance at the dinner.

Intense interest in spheroidal carbon or nodular cast iron was indicated at the joint gray iron-malleable iron session held Tuesday afternoon with nearly 800 in attendance. Hyman Bornstein, Deere & Co., Moline, Ill., and C. O. Burgess, Gray Iron Founders' Society, Cleveland, were chairmen. The meeting consisted of a panel discussion, with Don J. Reese, International Nickel Co., New York; Charles K. Donoho, American Cast Iron Pipe Co., Birmingham; Gosta A. Vennerholm, Ford Motor Co., Dearborn, Mich., and Richard G. McElwee, Vanadium Corp. of America, Detroit, as leaders.

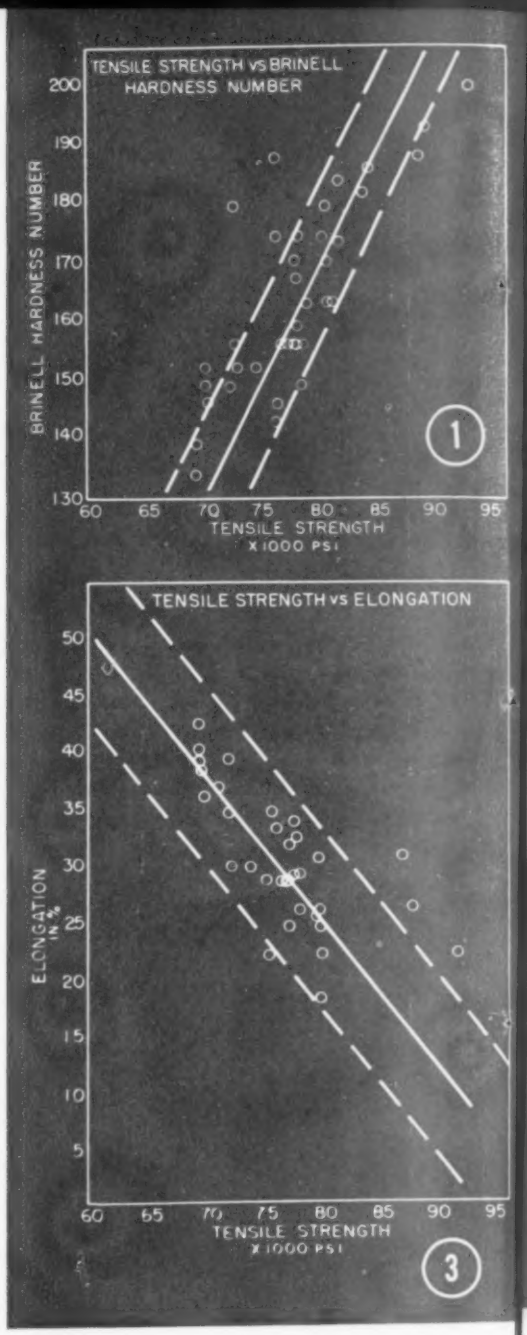
Mr. Reese said that spheroidal carbon iron can be produced in various types of melting units, and that an iron containing 3.50 per cent C and 2.75 per cent Si is suitable for any section thickness from light to heavy when treated with magnesium to convert the carbon into the spheroidal form. Hardness of the material is about the same as that of gray and malleable irons of the same chemistry, but can be varied over a wide range. It has better machinability than gray and malleable irons for the same condition and chemistry, and will wear at least as good as flake graphite gray iron. Growth of spheroidal iron under repeated heating is less than gray or alloy gray irons.

Largest daily commercial production by any foundry so far has been 50 tons. Raw material charges for production may vary from 100 per cent steel scrap to 100 per cent pig iron or any combination between. It was stated that a charge composed of sashweights has produced a satisfactory product. Sulphur content is not a limiting factor. Mr. Reese said that alloy residuals are not a necessary (*Please turn to page* 125)

Above—New AFS directors elected for three-year terms. William B. Wallis, retiring president, will serve as a director for one year
Left—The annual banquet concluded the convention

Hardness Test Measures Tensile Strength of Manganese Bronze

By ROBERT J. FELTRIN
Metallurgist
Wm. Kennedy & Sons Ltd.
Owen Sound, Ontario



IN THE manufacture of manganese bronze, as in other alloys, certain physical properties must be obtained. At Wm. Kennedy & Sons Ltd., Owen Sound, Ont., manganese bronze is cast for marine propellers up to 20 ft in diameter. These propellers must meet a minimum tensile strength of 70,000 psi required by the producers and should not exceed 80,000 psi tensile as stated by Sheehan and Dickerman,[1] since manganese bronze above this limit may be susceptible to stress corrosion failure. In order to obtain a tensile of 70,000 to 80,000 psi the manganese bronze is made to the following chemical composition:

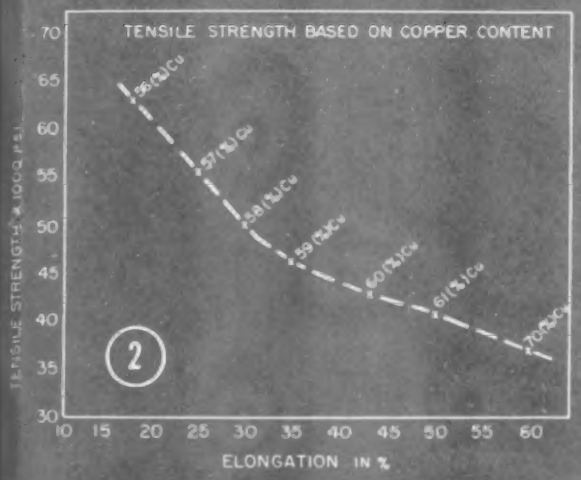
Cu 56-58 per cent, Zn 37.0-41.0 per cent, Mn 0.5-1.0 per cent, Al 1.1-1.3 per cent, Fe 0.9-1.1 per cent, Sn 0.4-0.6 per cent, Ni 1.0 per cent.

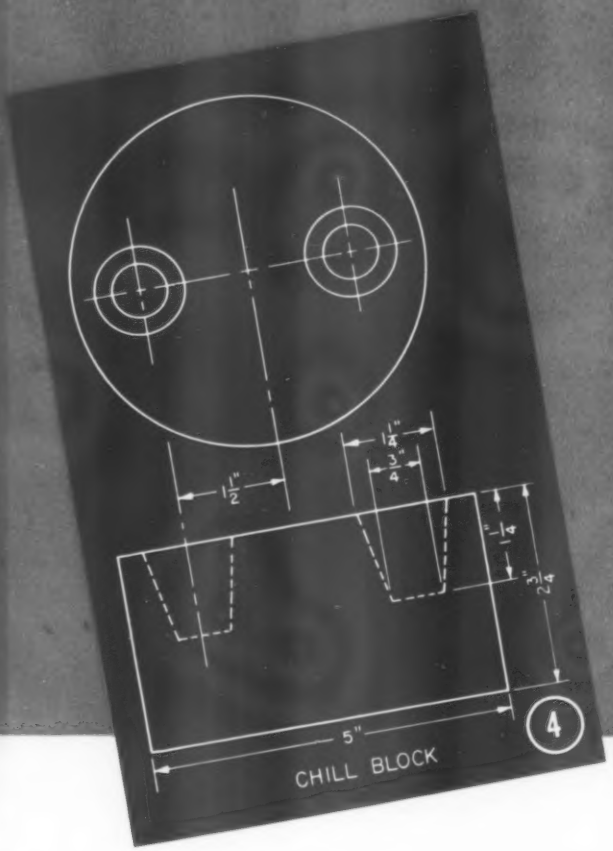
The copper-zinc base is the standard by which the tensile strength is estimated, then the effect of the hardness is calculated. Fig. 2 shows the curve by O. W. Ellis[2] which gives the tensile strength based on copper content.

Once the charge has been calculated, the heat is started. In melting and flaring the metal a certain loss is expected, particularly zinc. Since a loss of zinc results in lowering of tensile strength a check test is needed to determine the tensile strength of the metal before it is ready to pour. Our practice has been to cast rectangular samples in iron molds and submit them to bend and fracture tests while a sample is also sent to the laboratory for a copper determination. From the bend and fracture tests, ductility and soundness of the metal are judged, and tensile strength is predicted from the copper determination.

Since a preliminary copper analysis takes 30 to 35 minutes, the time element has been the important factor in this prediction. The need for a faster method of prediction is welcomed if production is to be maintained at a high level and cost of heats held at a minimum. A method devised by the author answered this problem by correlating hardness to tensile strength. This method permits a prediction in five to six minutes.

Two graphite chill blocks were machined from broken electric furnace electrodes, with cavities in each in which the metal was cast. Fig. 4 shows the block used, with dimensions. The cavities were filled with metal from the furnace, dumped out immediately after solidification and quenched in water three minutes later. After quenching, the samples were submitted to a brinell hardness test. The four samples were used as a check against each other.





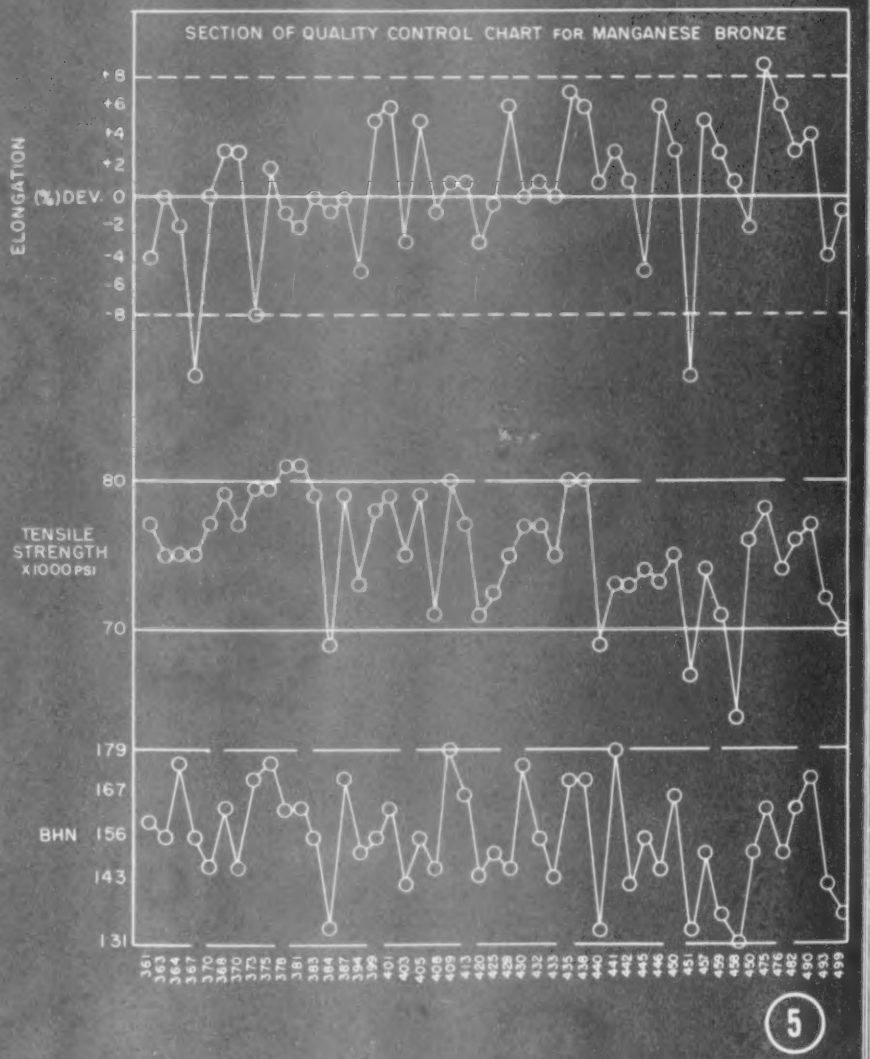


Fig. 1—Tensile strength vs brinell hardness
Fig. 2—Tensile strength based on copper content
Fig. 3—Tensile strength vs elongation
Fig. 4—Chill block used in pouring samples
Fig. 5—Section of quality control chart for manganese bronze with routine production results

This test was carried out over a period of three months in which hardnesses obtained were plotted against tensile strength obtained on sand cooled test bars. Fig. 1 shows the scatter plot with curve of tensile strength vs Bhn. Fig. 3 shows the scatter plot with curve of tensile strength vs elongation taken from the sand cooled test bars. From the curve of Fig. 1 it was then possible to predict the tensile strength in five to six minutes.

Once these theoretical curves were established, a series of thirty samples was taken from production heats and treated similarly to the test specimens. The results were plotted and fell in a definite range about the previous theoretical curve.

Table I (p. 230) gives the ranges of tensile strength predicted from the brinell hardness obtained. From it we see that the tensile strength was predicted within a $\pm$1500 pound range. Tensile strength vs elongation was also plotted and the points fell within a $\pm$ three point range. Table II shows the elongation range for each given tensile strength value. The calculation of the efficiency of this method yielded promising results. On the prediction of tensile strength by brinell hardness, predictions were accurate 90 per cent of the time and this figure improved as the test was applied to production heats. The discrepancies are due to many probable reasons, a few of which are: (*Please turn to page* 230)

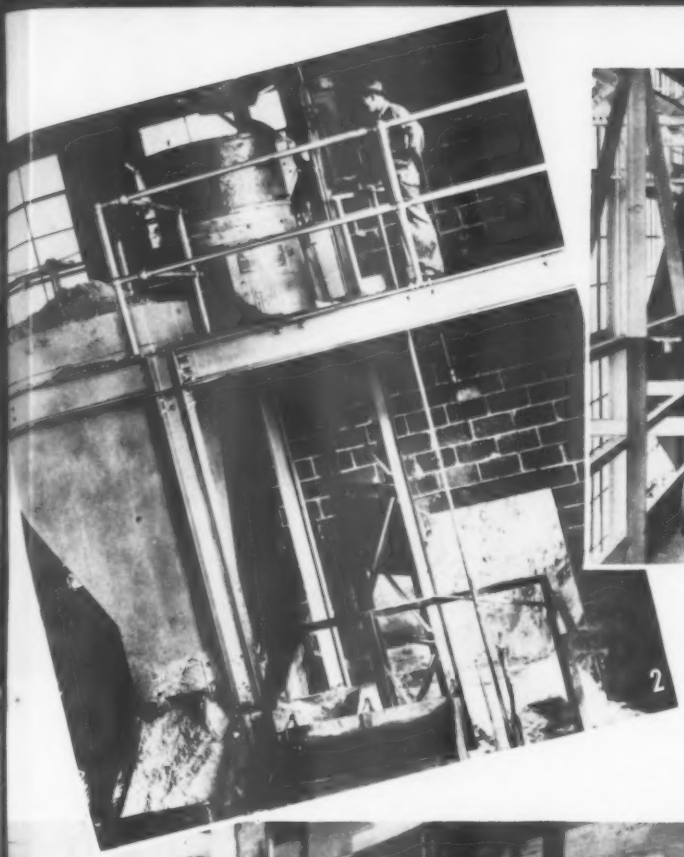
Handling Materials IN THE COREROOM

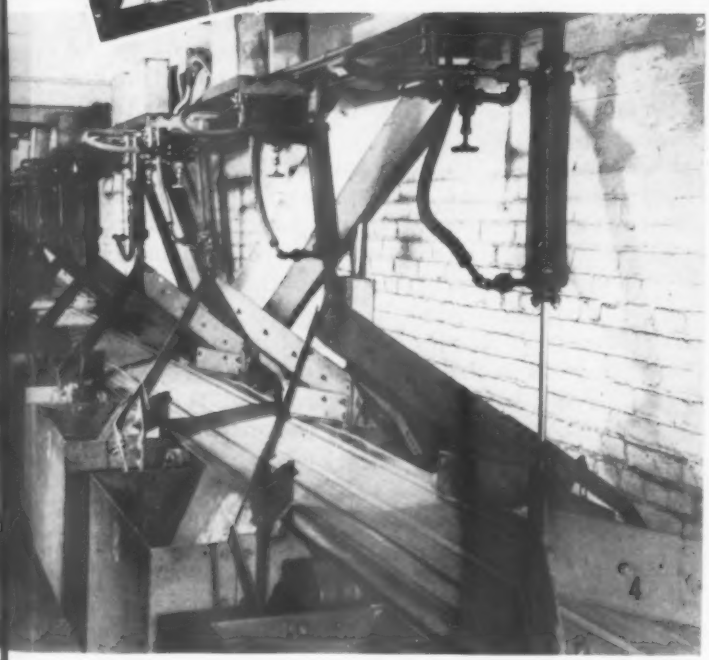
Equipment for handling materials in the coreroom is discussed in this fourth of a series of articles dealing with movement of materials in foundry operations. Previous articles dealt with materials handling equipment used in the foundry yard, furnace charging and in the molding department

By ROBERT H. HERRMANN
Associate Editor
THE FOUNDRY

REASONS for mechanizing the coreroom are much the same as those for mechanizing the molding department. (THE FOUNDRY, March, page 84, describes materials handling equipment used in the molding department.) Coremakers, like molders, are highly skilled workmen. Their time is spent most efficiently when they are devoting their efforts with a minimum of interruption to making cores. They should not be kept waiting for tools and materials, and should spend a minimum amount of time and effort in carrying sand, driers, coreplates or cores.

Mechanical equipment supplemented, when necessary, by unskilled labor can relieve the specialist of these time-consuming and unproductive activities. When materials are delivered to the coremaker at the correct time and place, he can devote full time to his specialty, with consequent improvement in production per man and quality of work. Moreover,





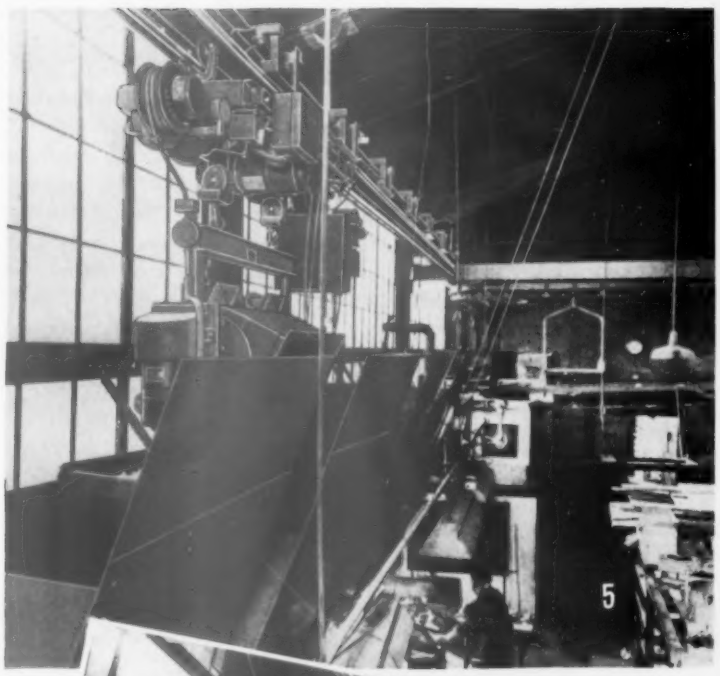


Fig. 1—Slider belt conveyor carries green cores to vertical type core oven

Fig. 2—Core sand is hoisted by measuring bucket to muller mounted on platform

Fig. 3—Hand-pushed carts distribute sand to coremakers' storage hoppers

Fig. 4—Remotely controlled plows push sand off belt conveyor into coremakers' storage hoppers

Fig. 5—Overhead traveling, electric motor powered carrier transports sand from muller to coremakers

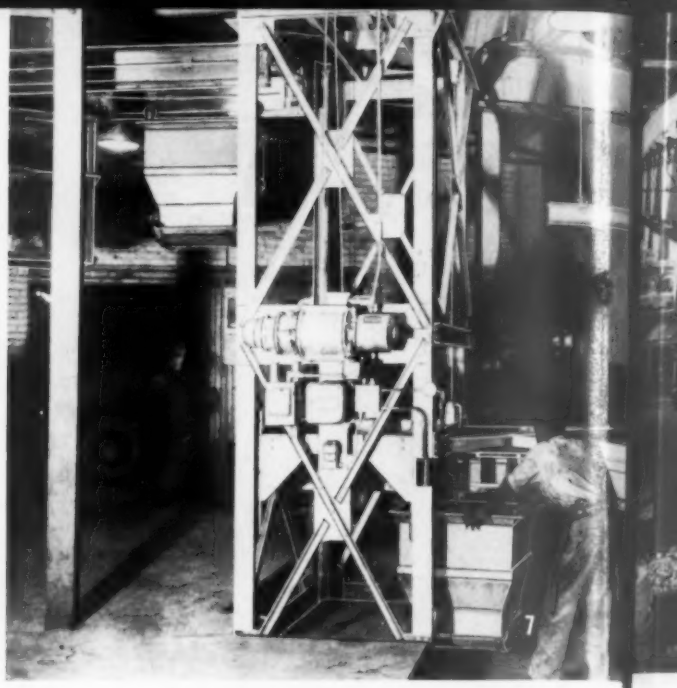
Fig. 6—Drop bottom, monorail-operated sand carrier services coremaking machines

his morale is improved, his status raised and the trade is made more attractive to new workers.

In general, mechanization provides a number of advantages, uppermost of which are economical and efficient operation, improved quality, greater output and better working conditions. Although the equipment itself is instrumental in achieving these results, its correct utilization also is important. Its installation must fit in with existing facilities and the arrangement of all production units should be planned for maximum utilization. Some of the accompanying illustrations portray the efficient arrangement of coreroom production facilities for greatest benefit.

Manual handling of sand and the distance it must be moved from storage to the muller can be reduced considerably by installation of equipment such as that shown in Fig. 2. In this installation core sand is shoveled from storage into the measuring bucket shown being hoisted to the muller on the platform. The sand is dumped into the muller automatically and the bucket returned to its original position to be reloaded. The prepared core sand is discharged directly into either of two hoppers—a storage hopper from which several coremaking stations are supplied and a smaller hopper directly over a core blower.

Auxiliary equipment available for this type of installation includes a screening and magnetic separating unit which fills the bucket automatically with clean sand. Normal position of the loaded bucket in the completely automatic system is just below the dumping point. When the operator desires to load the mixer, he pushes the control button and the bucket is elevated the short distance to the discharge point; there it empties its load and then descends to the loading position undeneath the storage bin where the bucket is filled automatically before returning to the normal starting point.



Distribution of the sand from muller to coremakers can be accomplished in a number of different ways which include the use of carts, hand wheelbarrows, motorized wheelbarrows, trucks and various types of conveyors. Fig. 3 illustrates the use of hand-pushed carts on a mezzanine floor to distribute sand to coremakers' storage hoppers. Sand is discharged through gates in the bottom of the carts.

Automatic distribution of core sand is shown in Fig. 4. Sand is carried from the muller on a belt over the coremakers' hoppers and is discharged into the hoppers by plows, which are raised or lowered by air-pressure energized lifting and lowering arms remotely controlled by solenoid. With such an installation, the switches for operating the solenoids can be located at each of the coremaking stations so that the coremaker can replenish his sand hopper simply by pressing a button whenever the supply runs low.

Another method of automatic sand distribution is illustrated in Fig. 5. The carrier transports sand from the muller to a preselected hopper in a bank of hop-

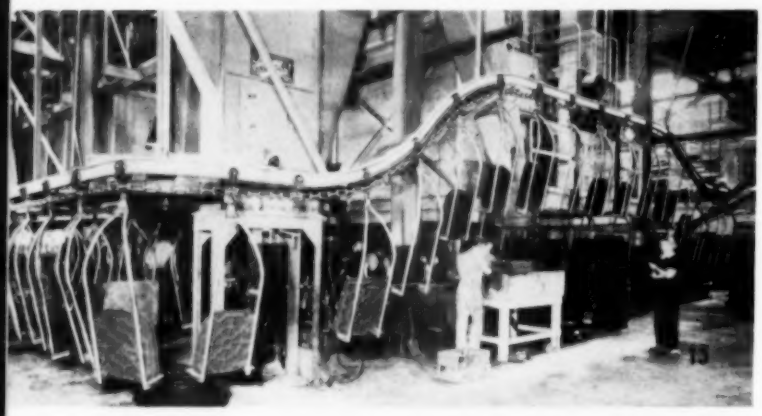


Fig. 12 — Coremakers' benches are grouped around a vertical oven

Fig. 13—Overhead trolley conveyor transports core plates

Fig. 7—Elevator for hoisting drop bottom carrier from muller level to monorail

Fig. 8—Overhead rack conveyor travels through continuous core-baking oven

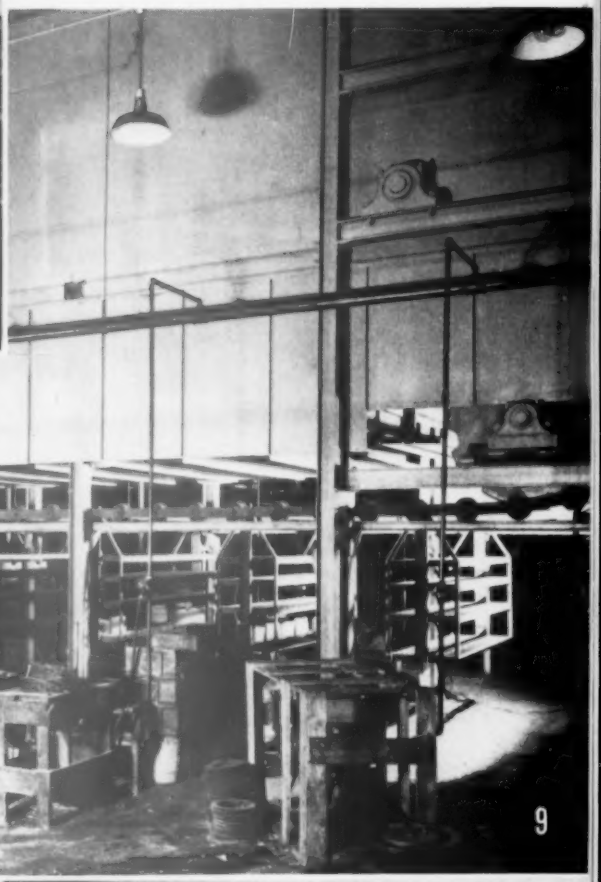


Fig. 9—Another conveyorized corebaking oven

Fig. 10 — Overhead monorail conveyor uses removable racks for handling cores

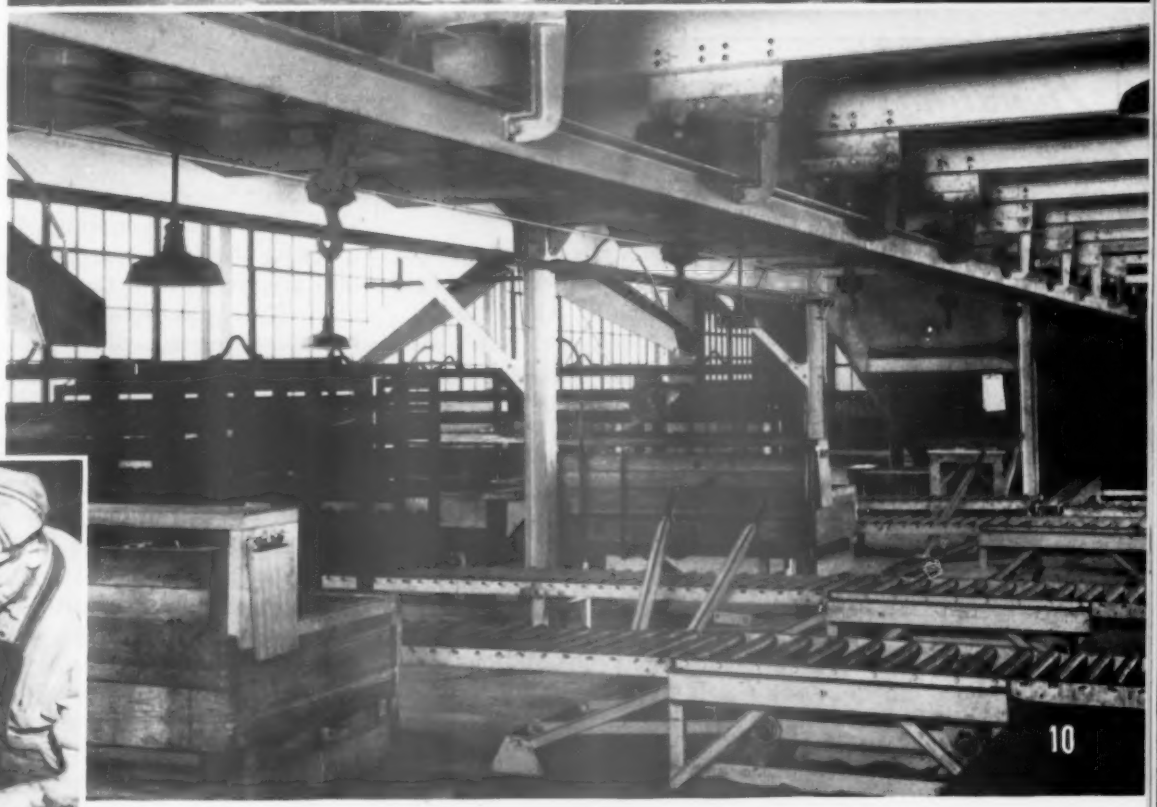
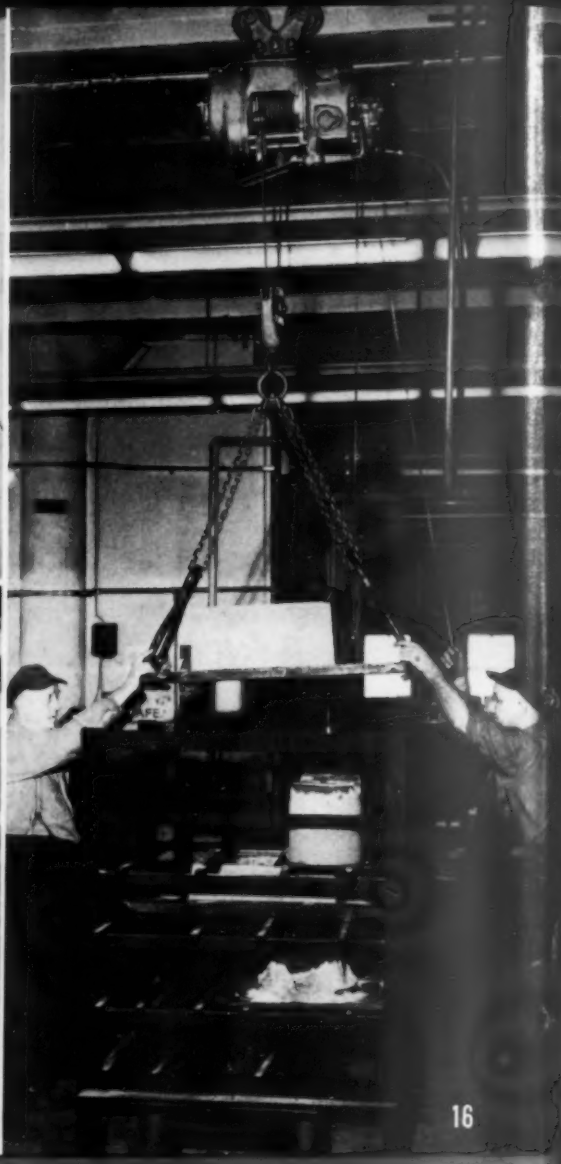


Fig. 11—Assembling cores on gravity roller conveyor



Handling Materials

pers. For loading, the monorail carrier is stopped at the muller and the bucket lowered by electric cable hoist to the discharge door of the muller where it can pick up its load of sand. When filled, the bucket is hoisted to transporting position. The muller operator selects the hopper at which the carrier is to stop, presses a button placed at floor level, and the carrier moves away along the monorail, driven by an electric motor mounted on the carrier. It stops at the preselected coremaker's sand hopper and the bucket is tipped automatically, dumping its load of prepared sand into the hopper. The carrier then travels back to the muller to pick up another load of sand. One carrier in this automatic sand distributing system is capable of servicing sixteen coremaking stations in each line.

Figs. 6 and 7 illustrate still another method of transporting prepared core sand to coremakers. Fig. 7 shows an empty bucket with bottom discharge gate being pulled off a movable monorail section in an elevator through a switch to one of two monorails, each extending in front of a sand muller. The bucket is placed at the discharge door of one of the mullers, filled with sand and then pushed back onto the movable section of monorail. The section is elevated, carrying the loaded bucket, and automatically locked into alignment with the monorail mounted at ceiling level. There the bucket is pulled off the elevator and transported over sand hoppers at coremakers' stations by a one-man electrically operated cab which travels on the upper monorail.

As shown in Fig. 7 at upper left, the cab can approach the elevator on either of two parallel monorail sections through a switch not shown in the picture. The elevator has two independently operating sections which transport buckets between upper and lower levels. Consequently, the muller operator can have a loaded bucket waiting at the top of one elevator section each time the cab returns with an empty bucket, thus preventing any undue loss of cab operating time. At the lower level, the buckets may be taken off either section of the elevator to either of the lower monorails through a switching arrangement mentioned previously. The buckets also may be pushed from

Fig. 14—Core racks being pushed into batch type ovens

Fig. 15—Racks also may be moved into ovens on overhead monorails

Fig. 16—Air hoist is used to load cores on racks

Fig. 17—Hoists also are used to close large cores

Fig. 18—Elevator carries cores between floors

Fig. 19—Core truck moves cores to foundry floor

either of the lower monorails to either elevator section.

Supplying coremakers with core plates is another material handling function which lends itself to mechanization. The use of an overhead trolley conveyor for this purpose is shown in Fig. 13. Belt conveyors, power roller conveyors, gravity roller conveyors or power trucks also could be used to perform this job.

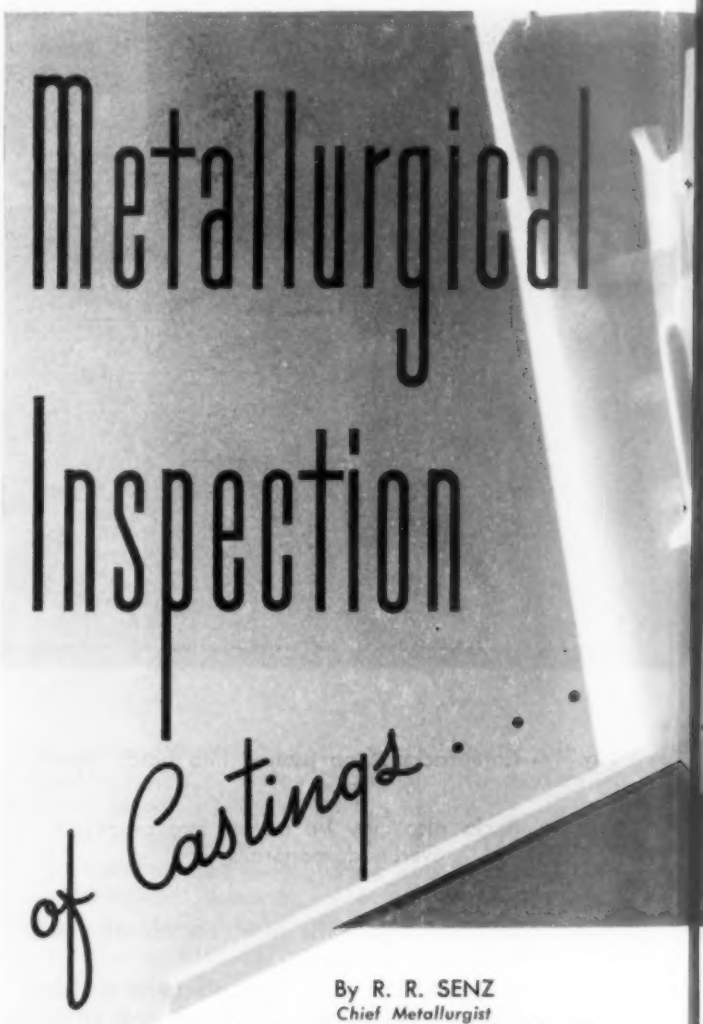
Efficient grouping of production facilities is illustrated in Fig. 12. In this installation, coremakers' benches are arranged in rectangular fashion around three sides of a vertical core oven. Each coremaker, upon finishing a plateful of cores, carries the plate to the oven and loads it on a carrier shelf. A passageway through the middle of the oven at floor level provides convenient access to both sides of the upgoing carrier so that coremakers do not get in each other's way when loading the oven shelves.

At the unload side, three gravity roller conveyors are used to carry the baked cores to the finishing stations. One man removes plates from the oven and places them, according to classification, on one of the three gravity lines.

Where a large number of coremakers make it impossible to group core benches and machines around the base of an oven, a slider belt conveyor, such as that shown in Fig. 1, may be used as a feeder line for loading the core oven. The belt in this installation is 20 in. wide and 80 ft long and gathers an assortment of cores from benches located along one side and coremaking machines on the other side. Speed of the belt is infinitely variable from 9 to 20 rpm and the conveyor has a load capacity of 25 lb per foot.

An automatic device stops the conveyor if a plate of cores is not removed from the belt before reaching either of two trip levers (*Please turn to page* 190)

Metallurgical Inspection of Castings . . .



By R. R. SENZ
Chief Metallurgist
Permanent Mold Plant, Cleveland Works
Aluminum Co. of America

INSPECTION of castings for metallurgical quality involves a variety of methods which can be divided into two general classifications. First are the destructive, and second are the nondestructive methods. Each of the processes in the two general groups can be used effectively to aid in establishing and maintaining satisfactory metallurgical quality, but no single type of inspection, used exclusively, can provide assurance that the necessary quality has been achieved or is being maintained.

Destructive Inspection Methods—As the name implies, destructive inspection methods result in the loss of the castings being inspected. This of course, precludes their use for 100 per cent inspection of castings. For establishing gating practices, or for spot inspection of production runs, however, such inspection is definitely useful and valuable. Further, some of the destructive types of examination can be employed by any foundry, regardless of its size or its ability to acquire specialized testing and inspection equipment.

The simplest of the destructive methods is that of cutting or fracturing the castings through critical areas where defects might be expected to be found, or are known to occur. For the detection of gross defects, the sawing or fracturing may be sufficient. If corrective action has been carried out to the extent that the defect has become very small, it may be necessary to draw file or machine the section to be sure that no small remnant of the condition remains.

For certain applications, the nature of the material or process being used inherently provides castings which are many times stronger than their end use requires. In these cases, the appearance factor is often of prime importance. Therefore, when the casting is to be finished by machining, polishing, or some other process which may uncover subsurface defects, a good means of inspection is to reproduce the customer's finishing operation as closely as possible. This type of inspection usually results in scrapping the inspected castings, and can, therefore, be used only on a small percentage basis. If adequate equipment is available to the foundry, however, this method of inspection can sometimes be used without necessitating the rejection of the inspection lot where no defects are uncovered.

During recent years, the purchasing of castings according to rigid chemical specifications has become more the rule. This has long been accepted in the light alloy field, but has lately become more common in fields of the older metals concurrent with the development of more and more new alloys. These requirements often result in the necessity of destroying one or more representative castings of a group in order to obtain samples for chemical analysis. Resort to the destructive method of chemical checking, however, is ordinarily used only where a particular lot of castings is suspected of being outside of limits chemically and where no alternative sample is available.

The determination of mechanical properties of castings is another means of checking the metallurgical quality of the castings. The first method of determining these properties is through the testing of standard specimens machined from representative castings of the group to be inspected. The results obtained in the testing of these specimens will indicate whether the castings have been made under the proper conditions, with the right material, and have received the proper heat treatment where such treatment is a requirement. Care should be taken in evaluating the results of such tests that the effects of section thickness and specimen size on the properties to be expected have been clearly developed.

A second process of examining the properties of castings is the use of the static breakdown test. In this test, the service loading of the casting is simulated under static conditions, and the loads applied by means of calibrated testing equipment until the casting has failed. This type of testing is particularly effective in helping to establish adequate gating and good foundry practices for the production of castings having unusually severe service strength requirements.

The microscopic examination of samples cut from castings provides still another destructive means of metallurgical inspection. Such examination can re-

veal, in many cases, the causes which underlie the presence of certain types of defects. For example, the microscope will reveal whether a crack has been produced by mechanical means or by stresses accompanying localized shrinkage. It will also reveal whether fine porosity is a result of precipitated gas or finely distributed shrinkage. Further, the microscope can be used as a tool to determine the effectiveness of heat treatments, fluxing treatments, alloying additions, and grain refining treatments. It may often also reveal the temperatures at which castings have been poured.

Nondestructive Inspection Methods — The nondestructive inspection methods are those which provide a means of examination by which castings can be checked for metallurgical quality and be sold if they pass the established minimum requirements. Many of the tools used for destructive inspection may also be used in the nondestructive methods simply through a change in their application.

Among the inspection processes listed under the destructive types was the chemical analysis of castings. More commonly, the determination of chemical composition of a group of castings is made by analysis of a separate sample which is poured from the same heat or melt as the castings which it represents. With the exercise of reasonable care in the melting and handling of the molten metal, the sample poured from the heat can be assumed to reflect accurately the chemical composition of the castings produced from the heat. Since some burning out or pickup of certain elements in the alloy is usually unavoidable, it is necessary that the representative sample be poured under the same conditions and at the same point in the operations as the castings.

The use of the spectrograph affords another means of obtaining chemical analyses. Ordinarily, analysis by spectrograph is made on separate, specially provided samples representing a group of castings. In some cases, however, this instrument can be used for obtaining analyses on the castings themselves.

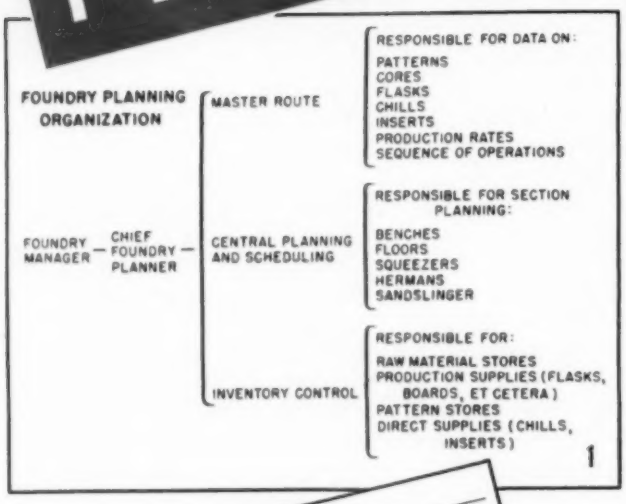
In spectrographic analysis, the sample is used as one of the electrodes of a spark gap. The elements present are identified by the occurrence of characteristic wavelengths in the radiation from the spark, and the quantities present are determined by comparing the spectrum of the sample with spectra of standard samples of known composition. The radiation is separated into its component wavelengths by means of a spectrograph which produces a photographic record of the spectrum. The quantitative comparisons are made by measuring the transmissions of the photographic images by means of a densitometer or microphotometer. Since a very small portion of the sample is actually consumed by the spark, it is essential that the area selected for sparking be one which is representative of the casting as a whole. The original surface must be removed in the area to be sparked, preferably by machining.

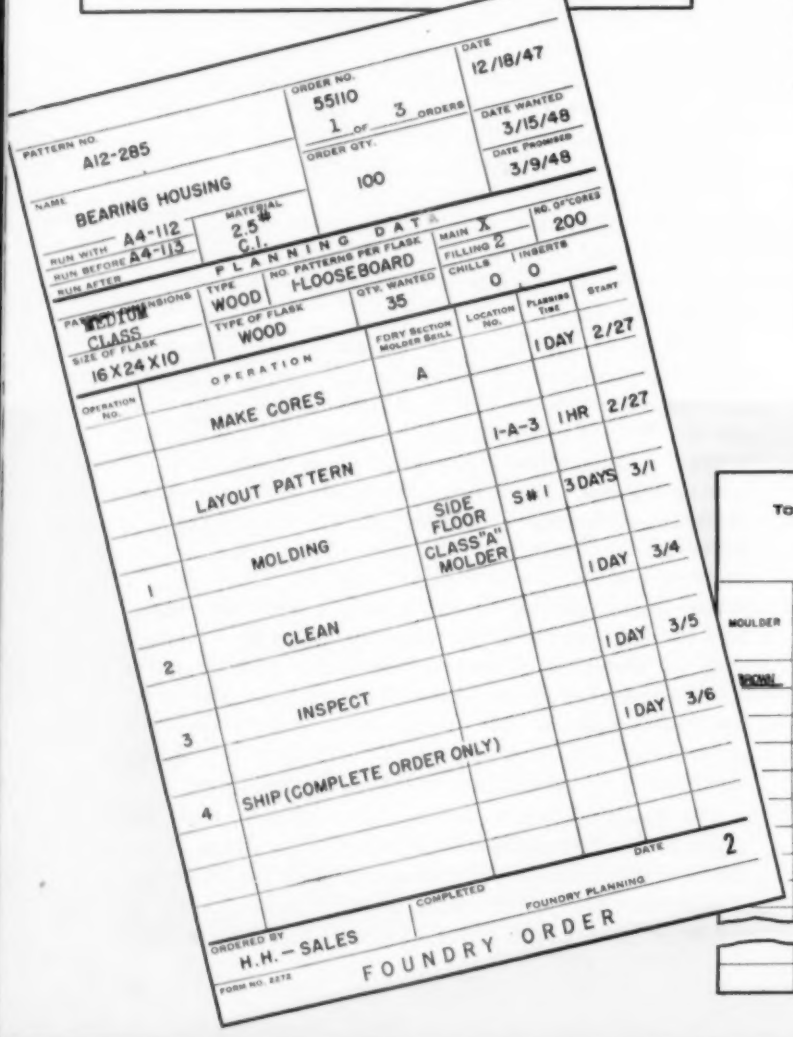
A third method of checking the chemical composition of castings is through the use of chemical spot tests. This method is useful in distinguishing between alloys of widely different composition. By filing or otherwise smoothing a small area of the casting and applying the proper chemicals, the presence or absence of certain elements can be determined by the colors appearing as a result of the chemical reactions taking place. Spot tests are occasionally useful in saving castings in cases where the presence or absence of a particular element is a determining factor.

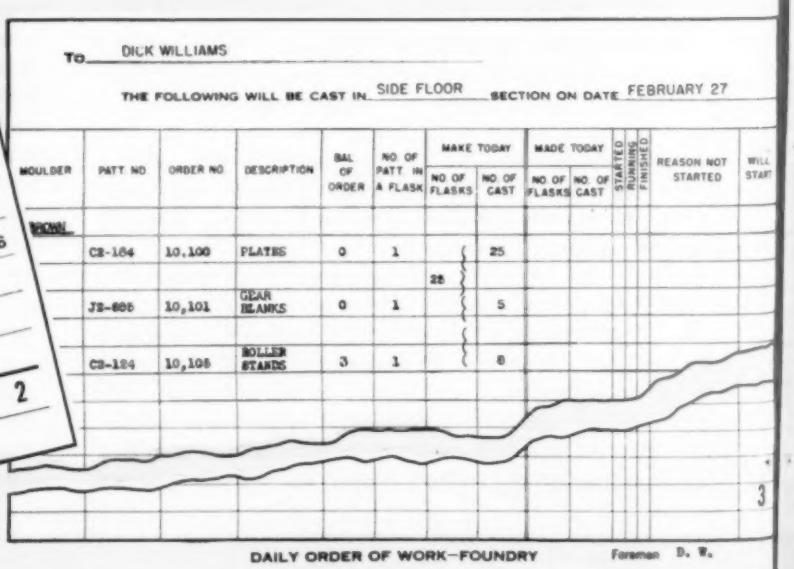
Another of the tools of metallurgical inspection which may double for both the destructive and nondestructive methods is the mechanical testing machine. The nondestructive method of mechanical testing involves the determination of properties on test specimens poured into a separate mold, or as an attachment to the casting from the same heat or melt as the castings. The properties obtained on such specimens, when treated with the castings and in the same manner as the castings, give an indication of the quality of the material and the effectiveness of the heat treatment as well. Specifications covering the properties of castings are generally written on the basis of the properties obtained from such separately cast bars, and only infrequently require the testing of specimens cut from the castings.

The Zyglo or black light method of inspection for surface discontinuities is another of the nondestructive types of inspection which provide an effective, inexpensive way of checking metallurgical quality on a 100 per cent basis. This (*Please turn to page* 246)

PLANNING *for Foundry*







SUCCESS in meeting production schedules and securing maximum utilization of men and equipment can be assured only by the use of well integrated methods for planning production.

The various production technics, however, are not enough by themselves. The methods must be designed in such a way that the functions of the organization can be properly co-ordinated to allow a maximum of teamwork and a minimum of individual domination.

The success of any method is in direct proportion to the harmony with which all groups work together to accomplish the desired objectives of production planning. Although this may seem to be quite obvious, it is a point that is overlooked often, especially in the installation of new production control procedures. In the haste to increase production and lower costs, the human angle of working closely with the people involved is often neglected and the tendency is to apply new methods from the top down—

Fig. 1—Foundry planning department is best divided into three principal groups

Fig. 2—Foundry order showing basic data required for planning as well as scheduled dates for starting production

Fig. 3—Sample of *Daily Order of Work* for a side floor section

By W. B. ATCHISON JR.
Wallace Clark & Co.
Management Consultants
New York

Production

the autocratic way.

Our experience has demonstrated that the installation of either one technic or an entire system of production planning is most successful when such an installation is made in the democratic way, i.e., from the bottom up, with the full participation of those concerned.

Before discussing the particular methods and technics of foundry planning and how they bring together various parts of the organization, it is well to outline the objectives for a well rounded system. It is the objectives, of course, that govern the type of methods used and these should always be the background for changes or additions to the particular system. The objectives include:

1. Knowledge at all times of the effect of current and future orders on foundry capacity.
2. Assurance of accurate delivery promises to customers.
3. More stable employment resulting from the ability to equalize the load of work by long-range planning. Management should be able to see, well in advance, what producing units are overloaded or will run out of work so that advance preparations can be made.
4. Increased production per man and machine hour by reducing or eliminating idle time due to delays resulting from such causes as lack of patterns, cores, or flasks, machine breakdown, etc.
5. Closer and better supervision on the foundry floor by having the planning details done by specially trained personnel (but with participation and review by supervision).
6. Knowledge of daily and weekly progress of the scheduled work in each foundry section.
7. Better executive direction by having decisions based on simple executive reports which are presented in *time for corrective action before trouble occurs—not as history!*
8. Improved co-ordination by gearing the departments of the organization to the same time objectives.

Foundry planning methods generally fall into two different classes. One is the mass production of standard items produced on a continuous basis; the other is for production of diversified orders in which the quantities are not great enough to permit continuous runs over long periods of time. This latter method of planning, commonly known as a job order production, requires technics that are extremely flexible and yet thorough enough to get the maximum coordination from all the foundry facilities to start and complete the work on time. The technics explained in this article are built around the requirements of job order planning. Although many foundries have

Fig. 4—*Daily Planning Chart.* Planning time is reserved on date job is scheduled to start by the angle opening to the right, thus: ⌜

Left-hand angle is date job is scheduled to finish, thus: ⌝

Two angles connected with light line represent total time scheduled for the order. Pattern number, description and number of castings for the order are written above the line, thus:

⌜A12-285 HOUSING-100

Heavy line drawn between the angles represents the proportion of progress to schedule

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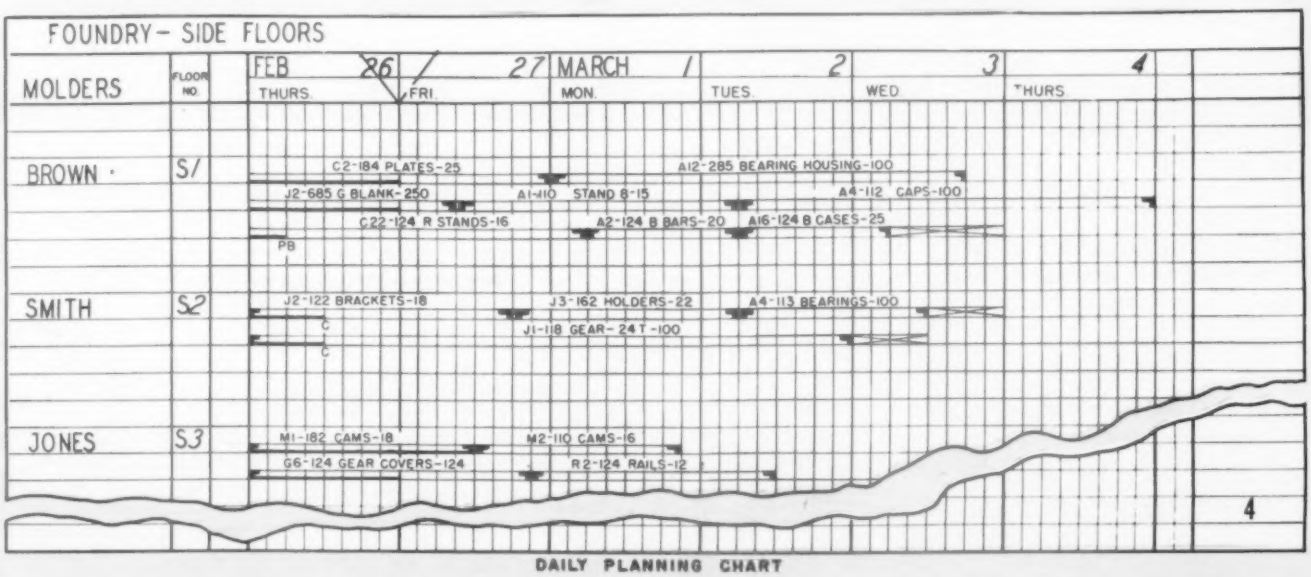
A V in the heading indicates date to which chart has been posted ⌄



DAILY PLANNING CHART

both continuous and intermittent types of production, the basic objectives apply to both types and many of the technics are easily susceptible to modifications for continuous mass production or long runs.

As molding is a principal foundry operation, it is necessary to reserve time, in advance, for the men and machines engaged in preparing the molds. Then the work of the coreroom, pattern storage, flask storage, pouring, inventory control, and other services must be timed so their work is co-ordinated with the molder's production schedule.

The most important single point in co-ordinating these efforts is to advise each department well in advance the dates on which it is expected to start its work and to enable each department to anticipate, *in advance,* why the "Start Date" cannot be met as planned. In this way the basic element in production, namely, time, becomes the first consideration of each department. Surprisingly enough, as fundamental as this may seem, this objective is not always found to be paramount in the direct supervisory levels of many foundries. To keep the men busy seemed, as a rule, to be uppermost in the minds of those directly responsible for production. This, of course, is important, but it should receive consideration only after the requirements of the customer have been planned.

Prerequisites for Planning—In recent years much emphasis has been placed on mechanisms which the originators claim will solve basic production control problems. One or two spectacular mechanisms, however, will not assure good production control and the co-ordination on which it rests. There must be a well integrated pattern of methods designed to accomplish objectives described previously and built on a foundation of data secured at the working level.

Many planning systems fail, or experience difficulty, because the basic essentials are not fully considered at the outset.

There are six prerequisites on which the complete foundry planning system must be built. These are:

1. *Organization*—A department whose responsibility is the day-to-day and long-range planning, in detail, for all the important producing units. This department should report to the executive who is responsible for foundry production. It must be as close as possible to the point, both organizationally and physically, at which the quickest action can be taken.

2. *Foundry Routing and Order Data*—Complete information on engineering specifications, foundry operation, materials, supplies, and tools required to make the casting. This information should be set up so that it can be easily duplicated and distributed as required in the daily planning and manufacturing routine.

3. *Reserved-Time Planning*—A method of reserved-time planning by which all production requirements are scheduled within the limits of capacity, and which will provide means for making accurate delivery promises.

4. *Daily Planning Routine*—Methods of converting the plan into action by daily work assignment for each molder, coremaker, and others; also daily reports of progress or lack of such, with reasons for delays so that prompt corrective action can be taken.

5. *Inventory Control*—Records for inventory control which show the current and future production requirements and the availability against requirements of all finished stock, raw materials, direct supplies, inserts, chills, patterns, flasks, and cores.

6. *Executive Reports*—Reports which furnish the chief foundry executives the current information they require for the executive planning of production, both long and short-range. These should include charts showing the load of work ahead, reports of delays, rejects, and current production.

Each prerequisite in the order above is described in more detail in the following paragraphs.

Organization—The Foundry Planning Department is best divided into three principal groups, namely, Master Route, Planning and Scheduling, and Inventory Control. The supervision of these groups is the responsibility of the chief foundry planner who reports directly to the executive supervising all functions of foundry production. An example of such an organization appears in Fig. 1.

The number of people required normally depends upon four factors: (1) the number of different sections (benches, floors, etc.; (2) the number of molders, or producing units within each section; (3) the type, variety, and number of orders handled; (4) the complexity or difficulty of molding and making the casting.

In some small foundries (25 to 30 molders) on bench or floor work, where each molder averages four or five different jobs a day, two men can norm-

Fig. 5—Report on orders delayed in starting

Fig. 6—Load chart prepared by the central planner

Fig. 7—Daily report of castings rejected

TO: DICK WILLIAMS

DEPARTMENT: SUPT'S.
DATE: JUNE 14th

THE FOLLOWING ORDERS ARE DELAYED FOR REASONS GIVEN: PLEASE ADVISE WHAT ACTION YOU TAKE

ORDER NO.	PART NO.	PART NAME	NO. OF PIECES	OPERATION NAME	SCHED. TO START	REASON FOR DELAY	DATE	ACTION
10240	C12-122	GEAR COVER	12	MOLDING	6/15	PATTERN BROKEN	6/18	PATTERNS BEING REPAIRED
10246	J6-120	STANDS	100	MOLDING	6/15	NO CORES	6/17	COREROOM WORKING SATURDAY
10247	C38-564	BEAMS	34	MOLDING	6/17	PATTERN BEING REPAIRED	6/18	NOW IN REPAIR SHOP
10249	Q1-43-70T	GEAR	12	PATTERN LAYOUT	6/17	NO 70 T IN STOCK ONLY 68 T	6/17	CONTACT CUSTOMER TO SEE IF IT SHOULD BE 68 T. THIS IS A REPEAT ORDER.
10251	R9-644	SOCKET	100	MOLDING	6/18	RAN OUT OF INSERTS		ORDERED FROM H.C. SMITH CO. DUE 6/20

PLANNER: S. Hamlin
FOREMAN: R. Arnold

EXPECTED DELAY REPORT

ally perform the work for the three groups, whereas in larger foundries, it may be necessary to have one or more persons in each group. In the case of a large foundry pouring 150 tons a day, with 175 to 200 molders, with some sections (bench, side floors) averaging 15 to 25 different jobs per molder, and 200,000 active patterns, the total organization runs between 17 and 20 people including supervision.

Regardless of size, the functions of each group of the organization must be performed. A basic organization of the type described works equally well in small or large foundries.

Master Route—The Master Route Section collects and records as permanent information the operations and running time, production facilities, materials, supplies, and specifications required in making the molds and castings. This data is collected on forms called Master Route Cards which form the basis for preparing all foundry orders, an example of which showing the details, appears in Fig. 2.

In collecting these data, the person in charge of the Master Route Section contacts many departments. He never uses information from his own experience without checking at first-hand with the people involved. In addition to compiling the basic data for foundry work, this group prepares and distributes the necessary number of copies of the foundry order after it has been planned.

A routing, or methods for manufacturing castings, is rarely static. Production methods are constantly changing. The methods engineer, the metallurgist, the foreman, and others are always trying to find a better way. Therefore, it is imperative to keep the manufacturing data abreast of every change. Orders to the foundry must reflect the latest information.

To accomplish this, the Master Route Section must provide for a flow of information from various sources which can effect a change. For example, one is the rate setting department. Production planning for each operation is based on the time it takes to do the work. If the time is changed for any reason, it must be reflected in the planning data. The usual method of accomplishing this is for the Rate Setter to give a copy of a notice of new rates or changes to the Master Route Section. The same applies for changes in operations, raw materials, tools, patterns (wood pattern to aluminum matchplates).

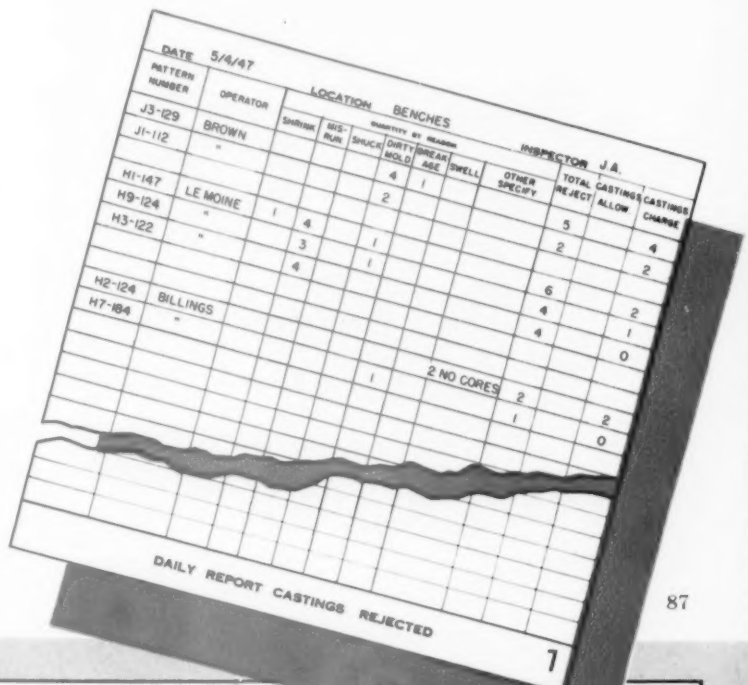
This section also periodically secures information from the chief inspector concerning the rejects by molders and by class of part. This information, over a period of time, is used to determine a percentage of allowances for rejects which will be considered in the order quantity. If it is found that the original allowance was not great enough, it should be increased on the original order so there will be fewer make-up orders. Also, this can work conversely, so if the original allowance for rejects is greater than the actual, the allowance should be reduced or too many castings will be made.

The Master Route personnel charged with gathering basic data should have a well rounded knowledge of foundry operation and, in addition, the extremely important faculty of being able to draw information out of people's mind to get it in the record in an orderly fashion.

Planning and Scheduling—"Planning is most effective when it decentralizes responsibility and yet maintains an overall co-ordination and control." (*Reserved-Time Planning for Production* by Wallace Clark).

The work of the Central Planning and Section Planning is governed by two different phases of time, responsibility and co-ordination.

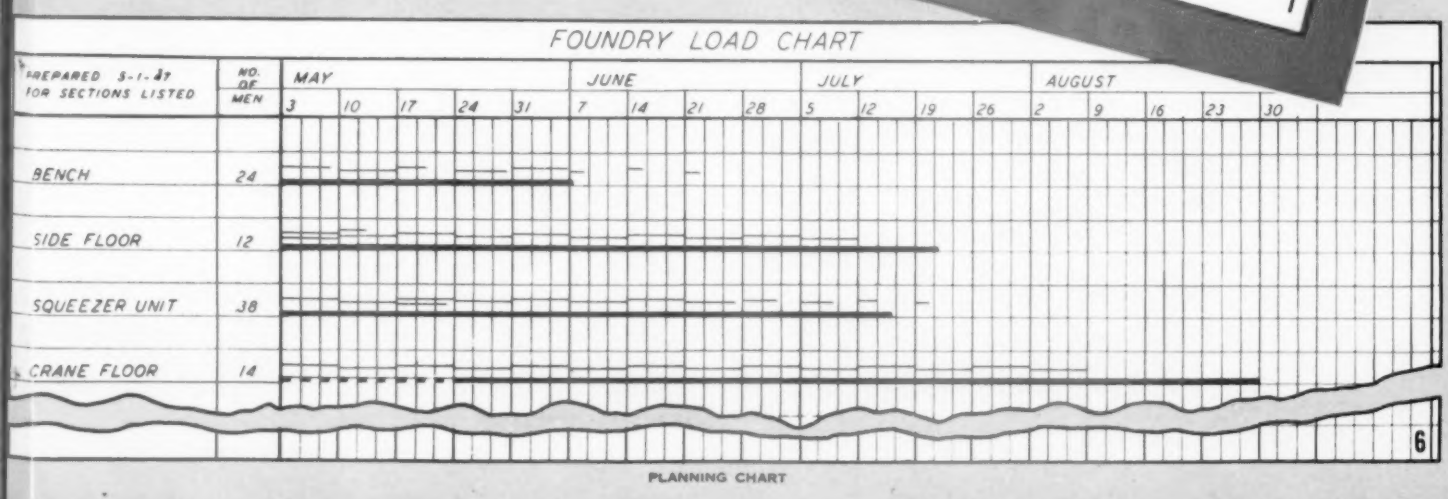
The Central Planning Section makes the long-range plans some weeks or (*Please turn to page* 240)


DATE 5/4/47

PATTERN NUMBER	OPERATOR	LOCATION BENCHES							INSPECTOR J.A.			
		QUANTITY BY REASON										
		SHRINK	MIS-RUN	SHUCK	DIRTY MOLD	BREAK AGE	SWELL	OTHER SPECIFY	TOTAL REJECT	CASTINGS ALLOW	CASTINGS CHARGE
J3-129	BROWN				4	1			5		4
J1-112	"				2				2		2
H1-147	LE MOINE	1	4						5		4
H9-124	"		3		1				4		2
H3-122	"		4		1				5		3
H2-124	BILLINGS								6		2
H7-184	"								4		1
									4		0
					1			2 NO CORES	2		
									1		2
											0

DAILY REPORT CASTINGS REJECTED

7


FOUNDRY LOAD CHART

PREPARED 5-1-47 FOR SECTIONS LISTED	NO. OF MEN	MAY 3 10 17 24 31	JUNE 7 14 21 28	JULY 5 12 19 26	AUGUST 2 9 16 23 30
BENCH	24				
SIDE FLOOR	12				
SQUEEZER UNIT	38				
CRANE FLOOR	14				

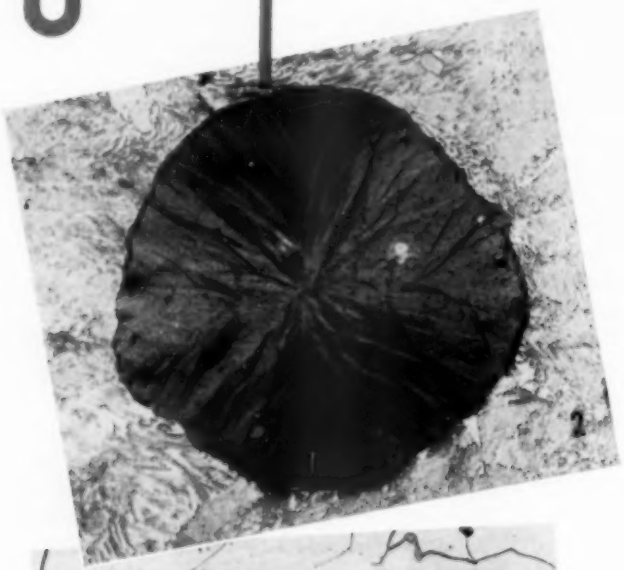
6

PLANNING CHART

Graphitization

In the malleable i

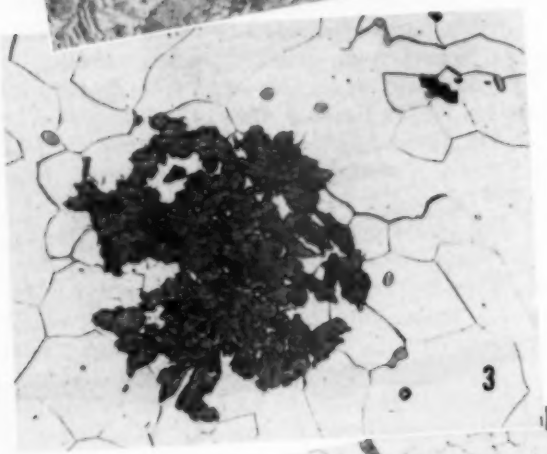
By H. G. HALL
Director
Castings Ltd.
Walsall, England



THE formation of graphite in malleable cast iron occurs during, and as a result of, an annealing treatment. A necessary condition is that the iron shall be white and free from graphite in the as-cast condition.

Cast irons are essentially iron—carbon—silicon alloys containing the elements manganese, sulphur and phosphorus in varying proportions plus some residual elements, including gases.

Their behavior during solidification varies considerably, but, given favorable conditions, whatever the state of carbon in liquid cast iron, the product would solidify as a mixture of iron and graphite. In other words, equilibrium would be established. Fortunately, such a process demands time, and usually, cast irons



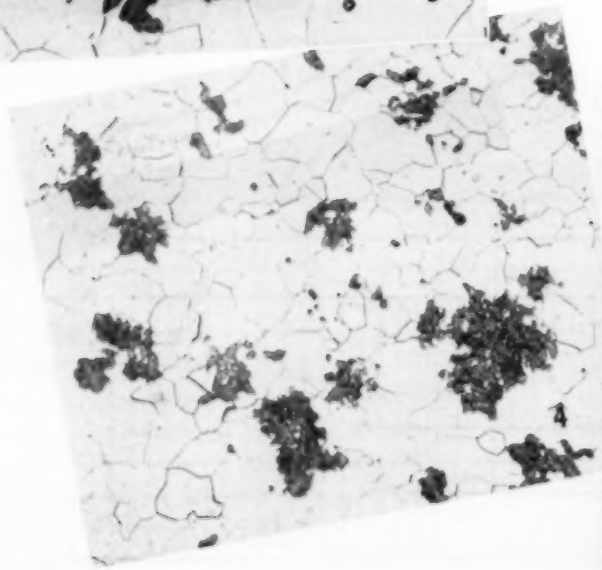


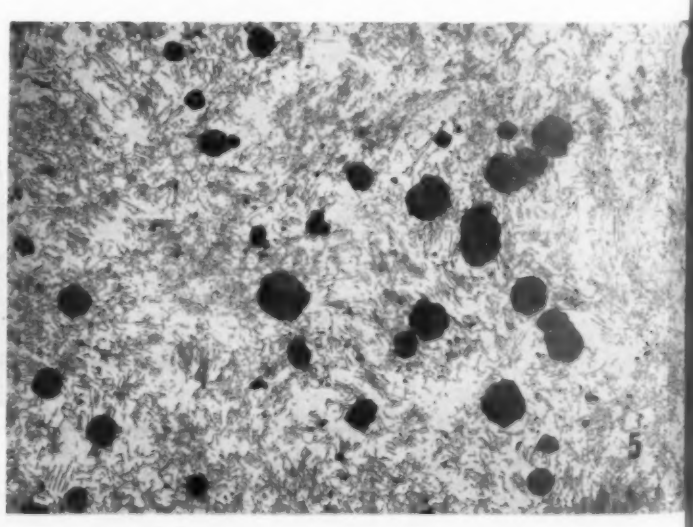
Fig. 1—Typical white iron structure. ×100

Fig. 2—A spherulitic nodule obtained by annealing an iron containing iron sulphide, FeS, at its annealing temperature. ×350

Fig. 3—A graphite nodule of the flake aggregate type in an iron containing all the sulphur as manganese sulphide. ×300

Fig. 4—Typical structure of blackheart malleable iron. ×100

Fig. 5—Typical structure at center of whiteheart malleable iron. ×60



This is the first of two articles comprising the exchange paper from the Institute of British Foundrymen presented before the 22nd convention of the Association Technique de Fonderie, held in Paris, Oct. 8-9, 1948

ble iron process

solidify as mixtures of graphite, iron carbide and iron.

In the case of compositions suitable for the malleable iron process[1], the time allowed for solidification is so short that heat is withdrawn through the mold faster than it is liberated by the growth of the crystals. Supercooling takes place, resulting in the formation of the austenite cementite complex, commercially known as white cast iron.

Under such conditions of composition and cooling the iron carbide or cementite produced is an unstable compound which may be extremely difficult to decompose and, in fact, appears to be completely stable below 650° C.

Fig. 1 illustrates a typical white iron structure which is hard and brittle. When iron of such a structure is annealed at any temperature between 650° and its melting point, cementite decomposes or graphitizes, giving graphite in the form of compact nodules, according to the reaction $Fe_3C = 3Fe + C$. The type of nodule produced may vary from the spherulitic nodule[2] shown in Fig. 2, to the flake aggregate nodule shown in Fig. 3.

It is well known that the formation of nodular graphite by the decomposition of cementite is an extremely interesting and complex reaction, occurring in the solid state, and about which our knowledge is still unsatisfactory. The reaction is fundamental in the production of malleable castings, whether they be blackheart or whiteheart.

During annealing to produce blackheart, sufficient heat is applied and time allowed for the cast iron to reach equilibrium, while surrounded by a comparatively inert atmosphere. The result is a structure as shown in Fig. 4, consisting of graphite nodules of the flake aggregate type, surrounded by crystals of ferrite.

During the annealing of cast iron of a suitable composition for the manufacture of whiteheart, graphitization also occurs, although the nodules are of a distinct type, as illustrated in Fig. 2, being completely spherulitic. The atmosphere surrounding the metal during annealing in this case is deliberately oxidiz-

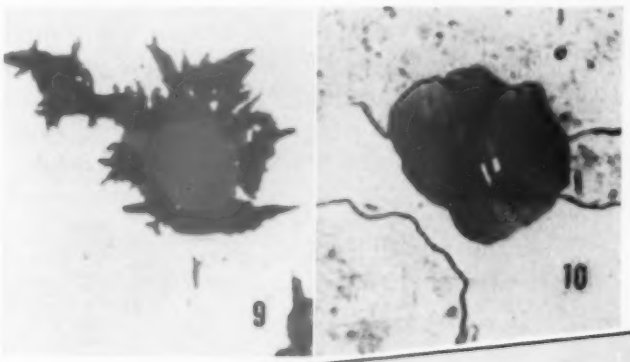


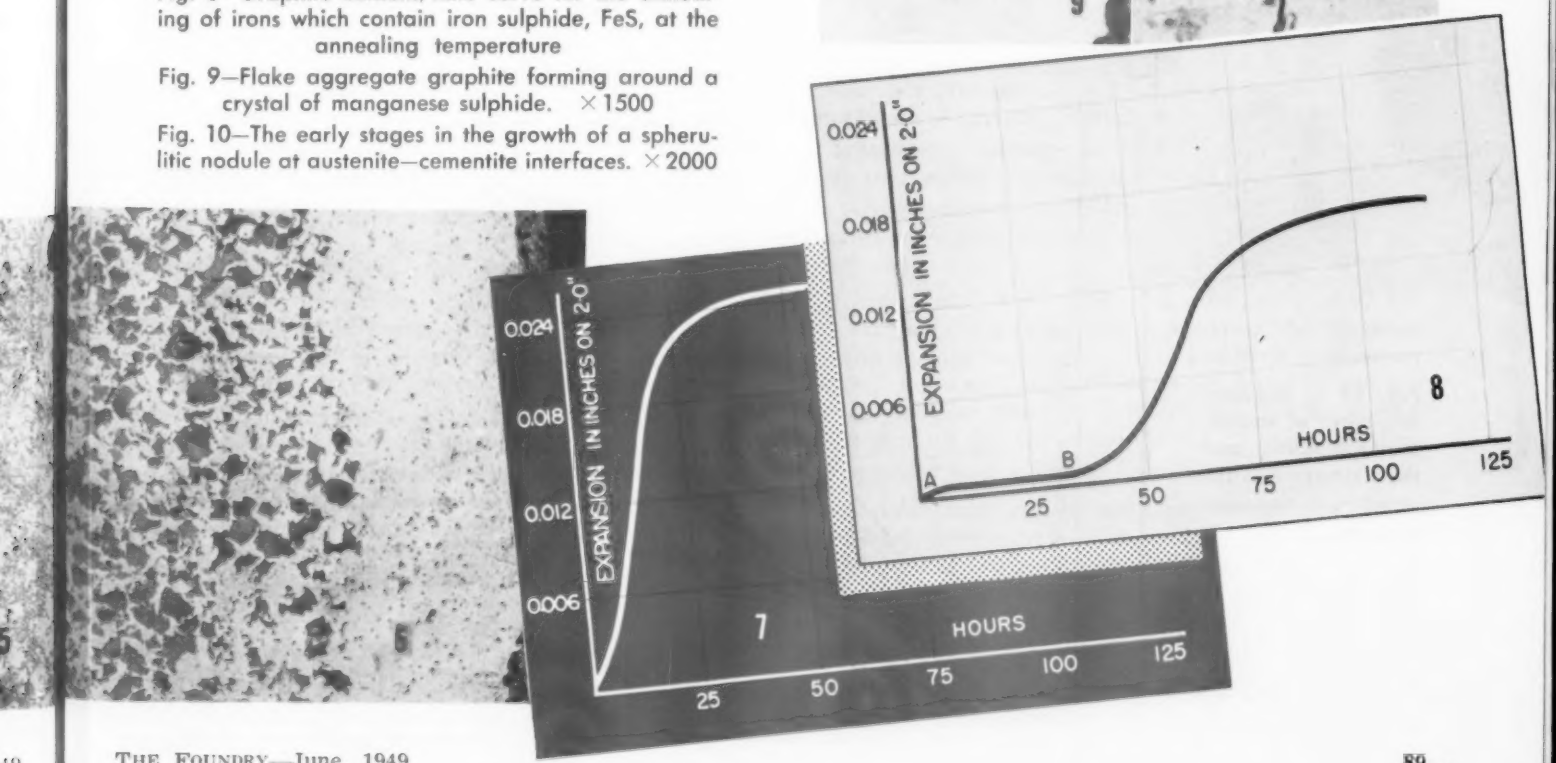
Fig. 6—Typical structure at edge of whiteheart malleable iron. ×60

Fig. 7—Graphite content/time curve for the annealing of irons with a balanced sulphur content

Fig. 8—Graphite content/time curve for the annealing of irons which contain iron sulphide, FeS, at the annealing temperature

Fig. 9—Flake aggregate graphite forming around a crystal of manganese sulphide. ×1500

Fig. 10—The early stages in the growth of a spherulitic nodule at austenite—cementite interfaces. ×2000



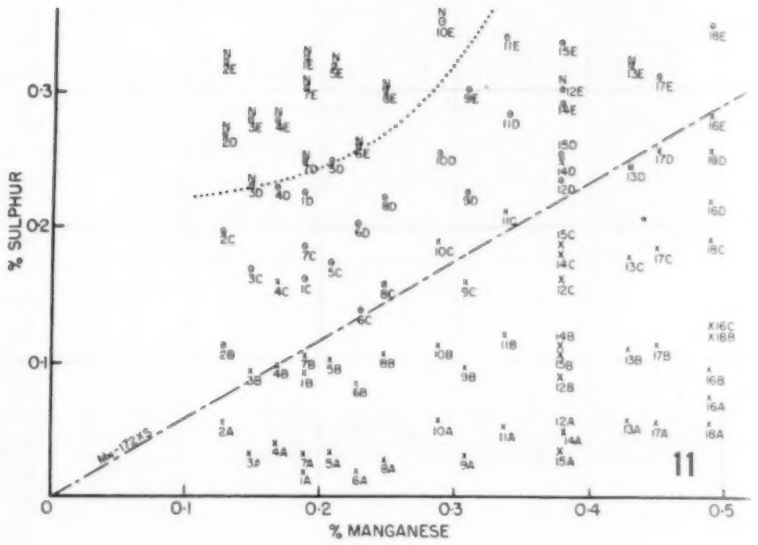
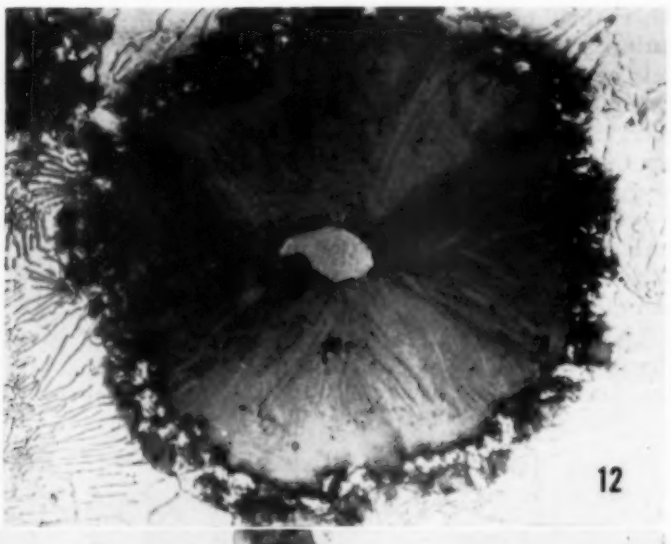


Fig. 11—The neutralization of sulphur by manganese assessed metallographically

Fig. 12—Spherulitic nodule having a nucleus of iron sulphide. ×1000



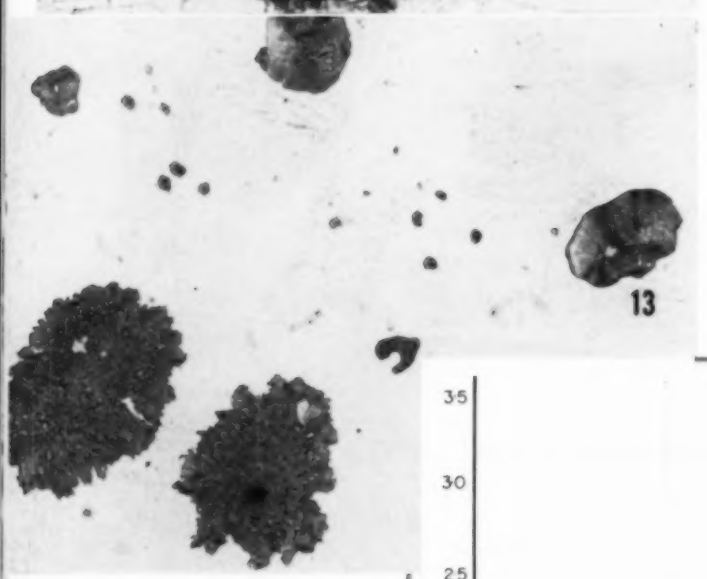
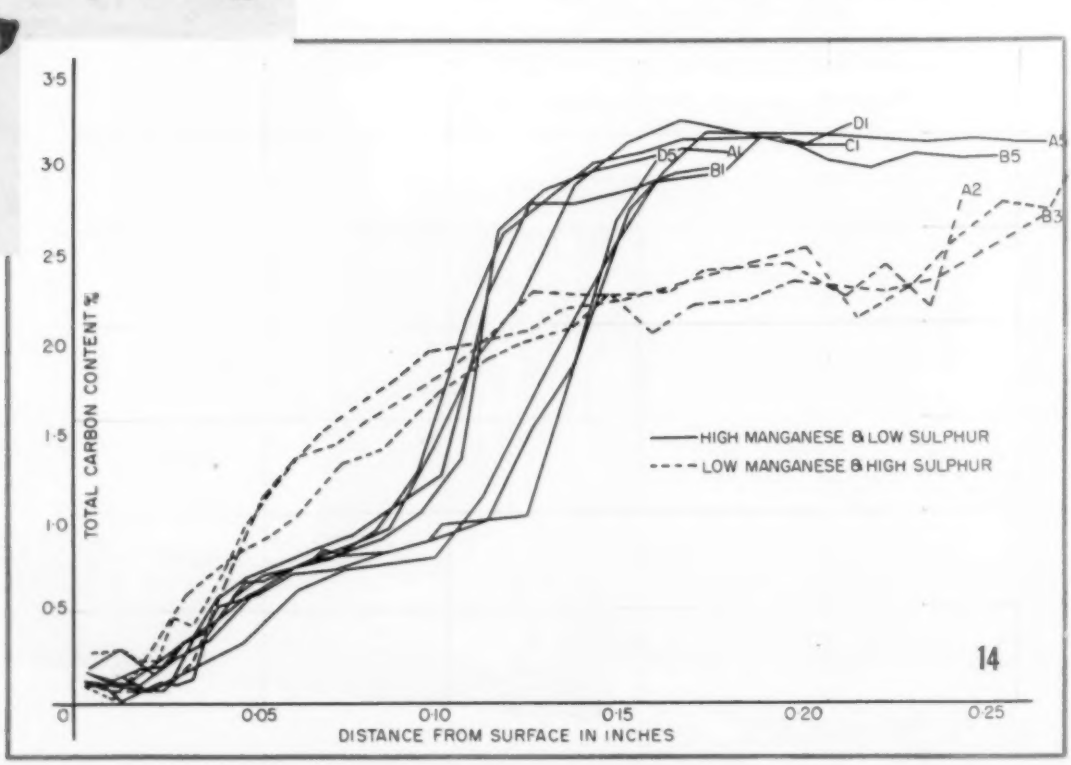


Fig. 13 — Showing two types of nodule, the spherulitic and the intermediate structure, in one sample. ×300

Fig. 14—Carbon content from surface to center



ing.

Metallurgically, the results of the annealing are that, not only is there an urge to achieve equilibrium in the metal, but also between the metal and the gas phase surrounding it. The structure resulting from this combination consists of an outer rim of ferrite merging into a central zone of pearlite, and nodules of spherulitic graphite.

The relative extents of each zone are determined largely by the time and temperature of the anneal and the composition and thickness of the casting. Typical examples of good whiteheart malleable are shown in Figs. 5 and 6.

Many factors influence the graphitizing reaction. The most important are the speed at which graphitization occurs, the number of nodules formed, and the size and form of such nodules.

The decomposition of cementite can be regarded as a series of steps, enumerated briefly as follows:

1. The formation of (*Please turn to page* 212)

What Makes a Good Foreman?

Efficiency of a department depends in large measure on the relationships between the foreman and those under his supervision, it is pointed out in this paper which was presented before the Ontario Chapter of the American Foundrymen's Society

By J. W. NUTTALL
Director of Supervisor Training
Canadian Westinghouse Co. Ltd.
Hamilton, Ontario

ACCORDING to the Taft-Hartley Act the supervisor (or foreman) is defined as an individual having certain managerial functions: An individual having authority, in the interest of the employer, to hire, transfer, suspend, lay-off, recall, promote, discharge, assign, reward, or discipline other employees, or responsibly to direct them, or to adjust their grievances, or effectively to recommend such action, if in connection with the foregoing, the exercise of such authority is not of merely routine or clerical nature, but requires the use of independent judgment.

Another definition, which is admittedly less legal but more generally acceptable, says "that task of the foreman is to make possible the greatest quantity of production within an accepted range of quality, at a resonably low cost to the greatest satisfaction of the owner, the worker and the customer. One of the most important elements of his task is to properly deal with the workers under his supervision so that the most effective work results with the least possible friction and irritation." If he can deal with all these points effectively, he is a good foreman.

This subject of the foreman's job is one about which many volumes have been written, and I want to confine my discussion to the matter of friction and irritation. Whether we work in a foundry, a machine shop, an electrical plant or a bottleworks we find cases of friction and irritation. Probably the greatest cause of interference with a man's daily work is due to dissatisfaction and discontent. The effect is the lack of morale and "don't-care-a-hang" attitude that develops into indifference and bitterness, argument and open friction.

Very frequently these causes of discontent can be removed or ironed out if they can be isolated; if we can find out just what they are. Higher levels of management are not close enough to the source of the trouble to be in position to observe them until the time comes that an official "grievance" has made its way up the line organization, gathering more weight and importance as it travels. The time that it should be settled is in its earlier stage, at the foreman level. The foreman, of all the line organization, is in the best position to do this. He is in close touch with the workers; he knows, or should know, their problems. He is in the position to observe them as soon as they appear.

Before speaking of ways and means of settling sources of discontent, we should ask: "What are the causes?"

Actually the main cause of discontent is not, as is often believed, a question of hours of work, nor of rates of pay; neither is it even regular employment. Some of the major requirements that have been revealed in questionnaires show up as the desire for:

A decent boss. Who has not thanked God for a decent boss, or done the reverse for not having one? As far as the foreman is concerned, we all know some who regard the world as a small orbit revolving about themselves. Everything that happens is studied for its effect upon them, and then there are the ones which the spychologist calls "emotionally immature," the type that flies off half-cocked whenever he gets peeved, and he gets peeved often. Then there is the overbearing, domineering kind found in many organizations. Their experience has told them that they are always right, theirs is the only way, and they do not withhold the opinions. Another type is the undecided individual who uses what is mistakenly called a woman's prerogative, who changes his mind every time he turns around. Then there is:

A chance to advance by merit. You men might believe that merit is recognized in all your shops. If it is, you are fortunate. There are many men in your organization who are just as sure that merit is *not* recognized.

Other points: *A good place to work; respect of fellow workers; companionship, friendship.* All of these are things that make one glad to get back to work on Monday morning; things that make one look on his job as another home. I believe that people should be as glad to get into work in the morning as they are to get home at night.

Encouragement, appreciation and recognition. All of us, I trust, have experienced the lift that comes from the remark of the boss, "That's a good job Joe." And it works with the people who work with you. You'll note that I say with you, and not for you. Most men work with you, for themselves.

Another of those irritating things that go toward discontent is a "belief in (*Please turn to page* 196)

Castings for Presses

COVER WIDE RANGE OF SIZES

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

AT A TIME when the trend is toward a military connotation for almost every project, the term "Operation Jobbing Shop" might well apply to the Toledo, O., foundry of E. W. Bliss Co., which produces a wide variety of gray iron castings for the firm's extensive line of presses. These castings range from a toggle latch weighing ½-lb to a press bed weighing 65 tons. Hardly any two presses are exactly alike, so that patterns and coreboxes must be checked carefully to see that they conform to the designer's blueprint. The company also produces numerous replacement castings to replace those worn out after long or severe service, and it is not unusual to receive a request for a part to a press made 25 or 30 years ago.

As indicated in the accompanying sketch, Fig. 1, the foundry proper is located in a brick and steel sash structure 450 ft long and 155 ft wide. Employee shower and locker rooms, foundry office, and active pattern storage department are in a one-story addition attached to one side of the building, while the core ovens are in another addition near one end and on the opposite side. These structures are 20 and 30 ft wide, respectively. The foundry is divided into three bays; two are 50 ft wide, and the other is 55 ft wide. The two cupolas, used on alternate days, are located at approximately the center of one side of one outside bay, and adjacent to the metal and coke storage yard.

Arrangement of the various departments is such that there is no backtracking; the castings move from the molding departments, to cleaning, to finishing and shipping departments in a straight line. Castings are made by sandslingers, on molding machines and by hand. Two locomotive-type sandslingers, one large and one small, are located in the north or 50-ft bay. The large slinger, operating in the west section of the bay, is employed for producing castings weighing from 200 lb to 4 tons. The small slinger located in the east section makes molds for castings weighing from 30 to 3000 lb. This unit is operated in conjunction with a mold handling unit which will be described later. This foundry bay is equipped with three 10-ton cranes which travel the full length, and three 3-ton wall cranes are located in the east section where the small slinger operates.

Molding of heavy castings is conducted in the west section of the 55-ft center bay, and the castings are made in pits or in flasks, or in combinations of the two, depending upon the size, as shown in Fig. 2. Molds are rammed with pneumatically operated rammers. Castings are cleaned and finished in the east end of this bay as well as in the adjoining bay. The cleaning department includes a 20 x 50 x 15 ft water-blast chamber where all except the smaller castings are cleaned rapidly by high-pressure water jets. The center bay is equipped with two 30-ton, one 20-ton, and one 15-ton crane.

The coreroom, shown in Figs. 3 and 4, occupies the west section of the remaining 50-ft bay, and is

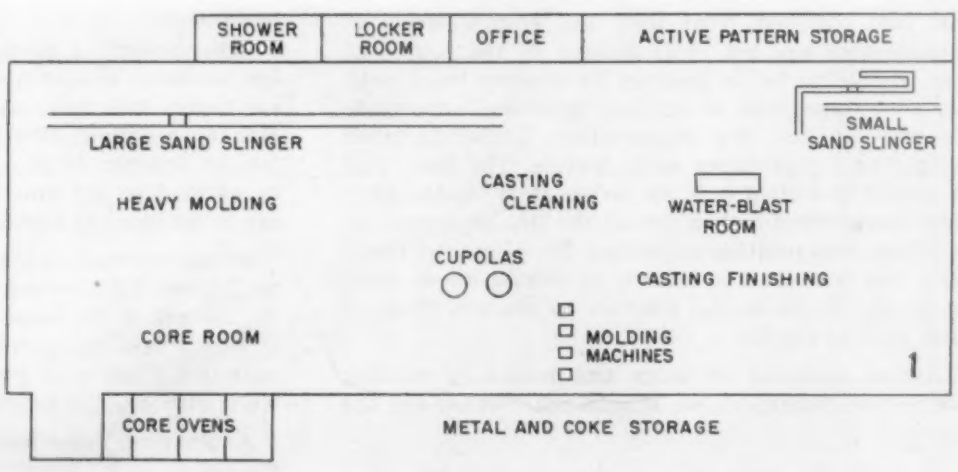


Fig. 1—Sketch showing general layout of the foundry as to arrangement of various molding areas and location of equipment

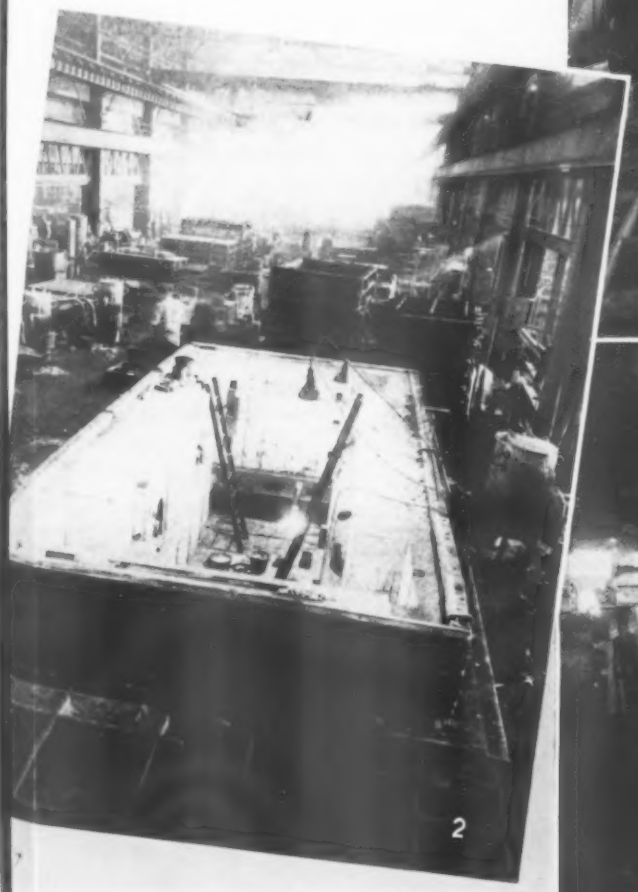
Fig. 2 (below)—First stage in making the drag mold for a large press using a combination of pit and flasks. Total depth of drag is 10 ft with 6 ft in the pit. About 70 tons of metal are required for pouring

Fig. 3—One view of the coreroom showing the wide range of corebboxes needed to produce the castings

Fig. 4—Another view of the coreroom. Large core ovens to handle the cores are at the left background

Fig. 5—View of the mold handling unit showing the mold in position to be rolled over and stripped from the pattern

Fig. 6—Flasks and gate and riser sticks are placed on the patterns on the mold conveyor at the right, and then moved to the conveyor at the left on a car



equipped with one 10-ton and one 3-ton crane. Most of the cores are large, as may be observed in the accompanying illustrations, and are made by hand. Adjoining the coreroom in a separate wing are located three large, car type ovens for drying large cores and one drawer type oven for baking small cores. As previously mentioned, the two cupolas are located approximately in the center of and at the edge of this bay. Just on the other side of the cupolas, small castings ranging up to 25 lb in weight, which can be handled on squeezer-type molding machines, are produced on four of those units. Remainder of the bay is devoted to cleaning and finishing small and medium weight castings. That department is equipped with a 10-ton crane.

The small locomotive type sandslinger is operated in connection with a mold handling unit. This procedure of mold making and handling has shown a large increase in production compared with the previous method. The old method resulted in a daily production of 30 to 35 molds while the present method averages 65 molds per day. The same types of molds were produced in both cases, making castings ranging from 30 to 3000 lb, with the majority in the upper range.

Equipment in the mold handling unit is comparatively simple, consisting of three sections of roller conveyor and a rollover pattern draw machine. As shown in the sketch, Fig. 1, and in Figs. 5 and 6, two 20-ft sections of roller conveyor, with the rollover machine installed between them, are located parallel to the third 20-ft conveyor section. Roller conveyor sections are 3 ft wide and mounted about 2 ft above the floor. The two lines are about 5 ft apart.

On the single section of conveyor, shown at the left in Fig. 5, and at the right in Fig. 6, one operator places the pattern in position and locates the flask which is transported by one of the wall cranes. He pushes the combination along to another operator who puts the gate and riser plugs in place, riddles on the required amount of facing sand, and positions any gaggers which are needed. When these operations are completed, he pushes the flask to the end of the conveyor, onto a short section of roller conveyor mounted on a car, shown in Fig. 6, and then moves the car and contents across to the other conveyor line.

Here the mold is pushed onto the first 20-ft section of that conveyor line by one or both men who alternate as sandslinger operators and helpers. Two men are required, one to operate the slinger and the other to hold down the loose gate and riser plugs which tend to become displaced through the action of the sand stream. When the conveyor is filled with molds, the sand is rammed in place with the slinger, as depicted in Fig. 5. After the molds are rammed they are pushed onto the rollover pattern draw machine by the fifth and remaining operator.

The pattern board is clamped to the head of the machine, and in addition a chain is placed around the mold to hold it in place. Head of the machine is raised to the vertical po- (*Please turn to page* 248)

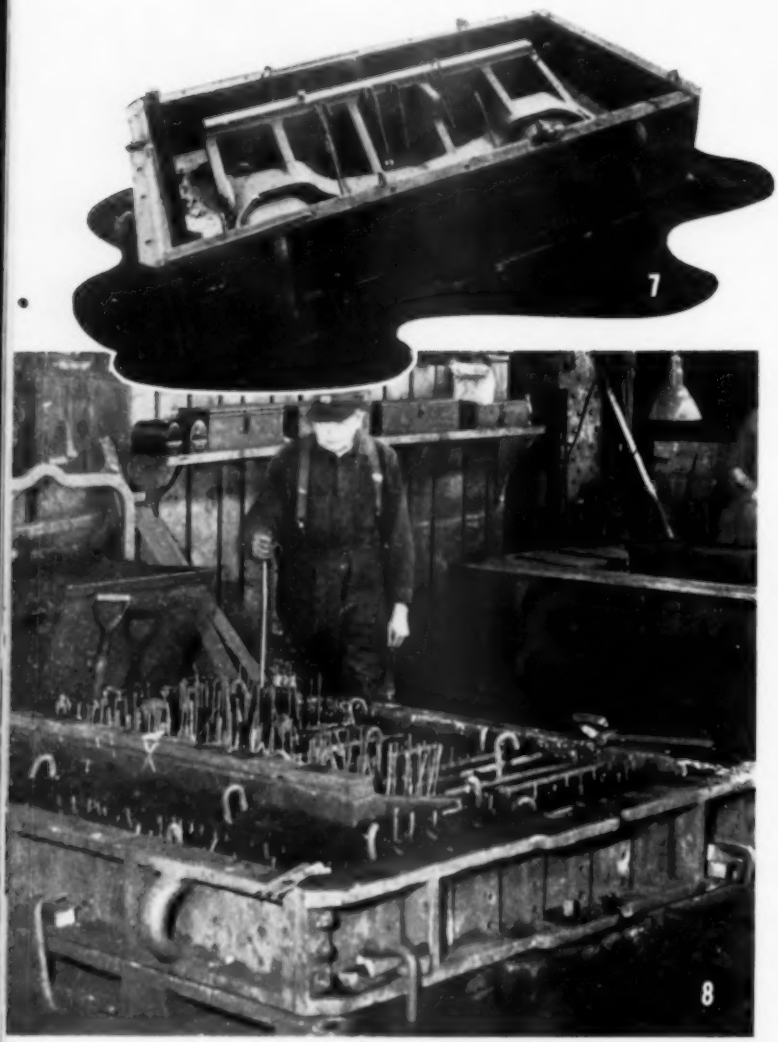


Fig. 7—Cope pattern ready for ramming

Fig. 8 — Partially rammed mold with top flask removed to show numerous gaggers, hooks and bars required

Fig. 9—Cored-up drag mold just before closing

Fig. 10—Sand conditions in the foundry are controlled closely through a well equipped sand laboratory

Fig. 11—Standard test bars poured at various times during the heat are used for determination of physical properties

Fig. 12—Crown casting for a large press which is partially cleaned. It required approximately 41 tons of iron for pouring

Heat Abstraction BY MOLDING MATERIALS

By THAD T. RICK
Metallurgist
Allis-Chalmers Mfg. Co.
Milwaukee

The author describes a practical method for determining the relative rate of heat abstraction by various molding materials. In general, this rate is found to be proportional to the apparent density for similarly bonded materials

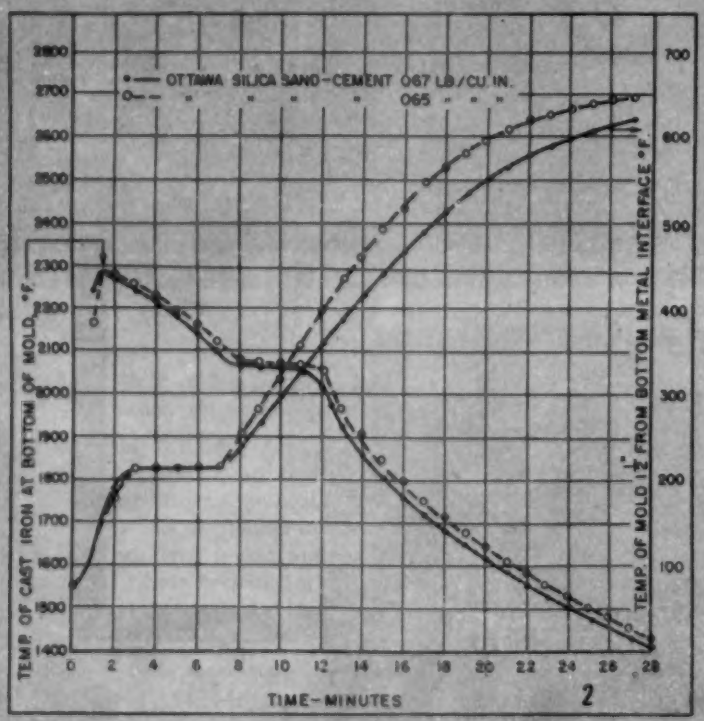
FOUNDRYMEN are occasionally confronted with the question of how fast various molding materials will chill a given cast metal. Since molding materials are usually complex mixtures, data available in literature on relatively pure substances are difficult to apply.

It is conceivable that the heat abstracting capacity of silica sand, for instance, would be different if the sand particles were bonded by an oxidized film of core oil, a hydrolized film of clay, or hydrated portland cement. In the first example, water is not involved, while in the last two examples steam is evolved when molten metal contacts the mold.

The solution of this problem, in the temperature range of molten cast iron when based on calculations involving the specific heat of the sand, its thermal conductivity, and such complicating factors as the heat of decomposition of core oil and the heat of vaporization of water, becomes tedious if not questionable. In place of an estimate a practical test has been devised which gives a relative measure of the heat abstracting properties of various molding materials as used in actual foundry practice.

The method consists of pouring a weighed amount (5230 g) of molten cast iron at a definite temperature (2560° F) into a cup mold (Fig. 1) of fixed dimensions, made of any of various molding materials. The cast iron was melted in an induction furnace. The temperature of the metal before pouring was measured with an optical pyrometer. When the desired apparent temperature of 2480° F was reached the metal was poured directly from the furnace crucible into the cup mold in approximately 10 seconds. With the pouring completed, the cup mold was immediately covered with an insulating brick 2½ in. thick.

A time clock was started at the beginning of pour-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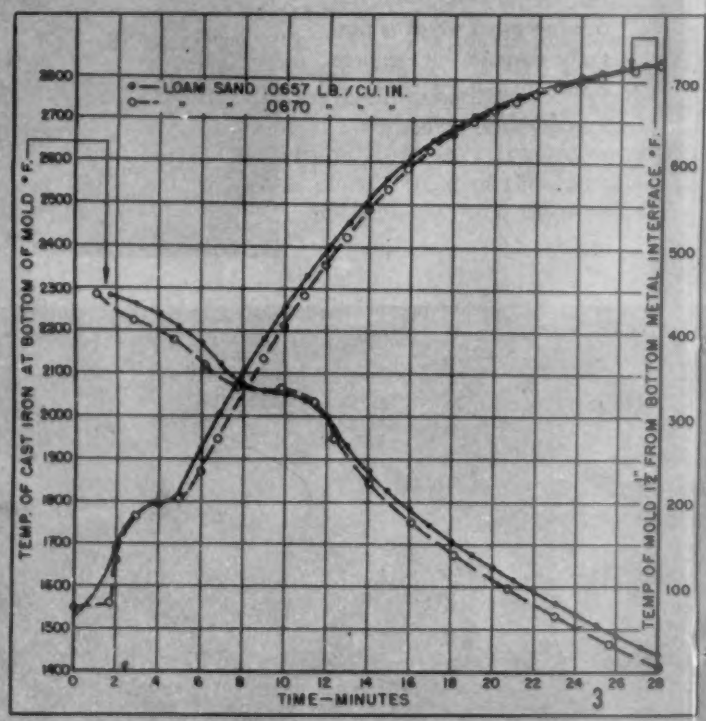
TEMP. OF MOLD 1½" FROM BOTTOM METAL INTERFACE °F.
TIME—MINUTES
2


LOAM SAND .0657 LB./CU. IN.
" " .0670 " " "
TEMP. OF CAST IRON AT BOTTOM OF MOLD °F.
TEMP. OF MOLD 1½" FROM BOTTOM METAL INTERFACE °F.
TIME—MINUTES
3

ing. Temperature readings were taken of the cast metal and the mold at one-minute intervals for a period of 30 minutes; at this point the mold approached a constant temperature. The apparent density of the cup mold was obtained by weighing the mold before pouring and applying the necessary calculations. Weighing the iron before melting and after pouring of different heats showed a metal loss ranging from 0.8 to 2 per cent of the original charge.

The cup mold (Fig. 1) used in the tests was formed by hand ramming moist molding materials into a mold pattern. Green sand molds were tested shortly after ramming while oil core sand molds were baked according to foundry practice. This cup mold, if used without a flask backing, will crack and allow the molten metal to run out. To overcome this difficulty the cup mold was placed in a steel molding flask. The annular space (1 in.) between the jacket and mold was filled with dry molding sand. The assembly rested on ¾-in. thick asbestos board.

Temperature of the cast metal was measured by an 18-gage asbestos-covered Chromel-alumel thermocouple imbedded vertically 1¼-in. off the centerline of the circular cup. The couple bead was covered with a woven asbestos sock to prevent direct metal-to-metal contact between the hot junction of the thermocouple and the molten cast iron. If the asbestos covering is not impervious to the molten metal the thermocouple will melt away and fail to function. The projecting couple was bent 90 degrees so the bead of the couple touched the raised boss at the center of the mold bottom. It is important that the thermocouple be located at the same distance from the mold bottom to assure reproducible readings.

The mold temperature was measured at an accurately positioned hole 1½-in. below the mold bottom. An 18-gage Chromel-alumel thermocouple was used with the bead at the center line of the mold. A 2½-in. thick insulating brick cover was placed over the cup mold immediately after pouring to decrease the high radiation losses which are obtained with an open top. The test loses sensitivity in differentiating the heat abstracting prop- (*Please turn to page* 182)

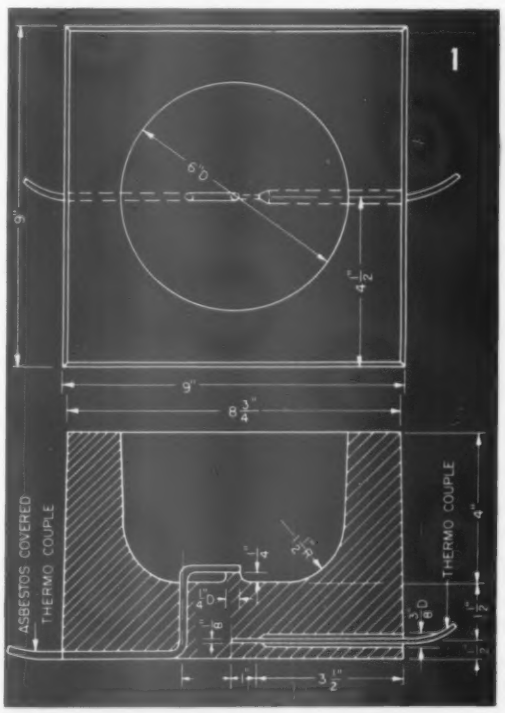


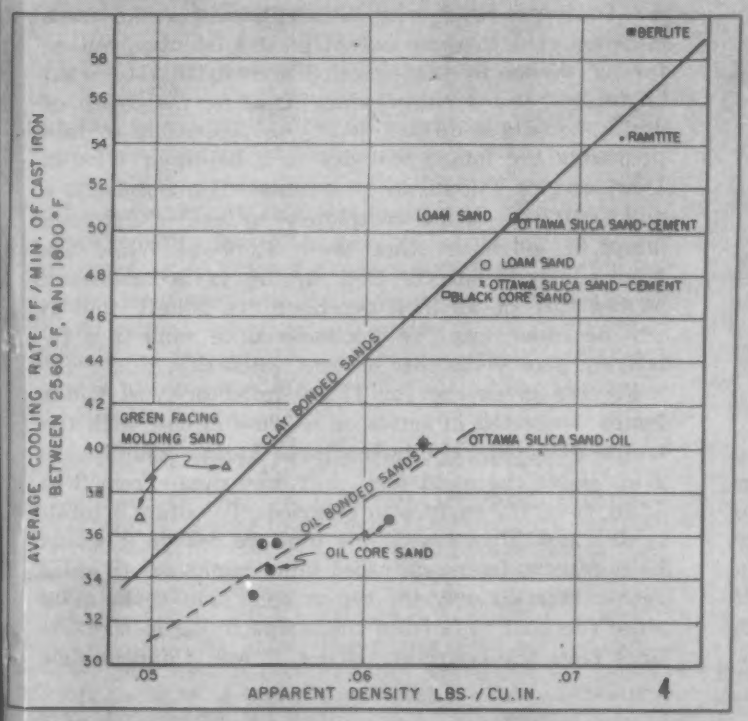
Fig. 1—Cup mold used in measuring relative rate of heat abstraction of molding materials

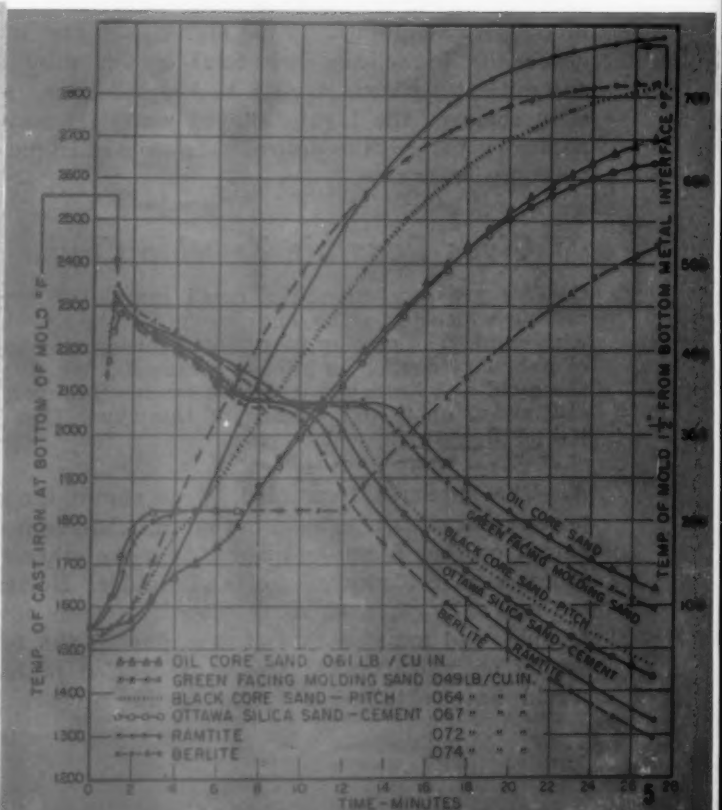
Fig. 2—Cooling curves of cast iron in cup mold made of silica sand and cement

Fig. 3—Cooling curves of loam sand cup mold

Fig. 4—Curves showing relative rate of heat abstraction of various molding materials as related to apparent density

Fig. 5—Cooling curves for different molding materials having wide range of apparent densities




TEMP. OF CAST IRON AT BOTTOM OF MOLD °F
TEMP OF MOLD 1" FROM BOTTOM METAL INTERFACE °F
TIME-MINUTES
OIL CORE SAND .061 LB / CU IN.
GREEN FACING MOLDING SAND .049 LB / CU IN.
BLACK CORE SAND—PITCH .064 " " "
OTTAWA SILICA SAND—CEMENT .067 " " "
RAMTITE .072 " " "
BERLITE .074 " " "
OIL CORE SAND
GREEN FACING MOLDING SAND
BLACK CORE SAND—PITCH
OTTAWA SILICA SAND—CEMENT
BERLITE
RAMTITE
5

Questions AND

Corrosion Conditions Severe

Q.—Can you give us any information on the best and cheapest cast material which can be used for piston pumps with the maximum resistance to sulphuric acid of 108 per cent concentration, up to 70° C, and containing from 2 to 65 per cent sulphur trioxide? Is the 14 per cent silicon iron useful for the pumps or is the austenitic cast iron containing Ni and Cr without the Cu preferable? Is it possible to use plain cast iron or steel with 0.10 per cent C?

A.—Definite reply to your inquiry on the most suitable cast material for piston pumps for handling fuming sulphuric acid hardly is possible since a number of variables are involved. While you mention some of them, there probably are others such as possible separation, etc., which will have an important bearing on the rate and mode of corrosion. The only method of obtaining a sound basis for selection of the most suitable material will be to carry on simulated service tests where the most likely materials are subjected to exactly the same conditions as would be encountered in industrial application.

While concentrated sulphuric acid can be handled by gray cast iron, you have the additional complications of elevated temperatures, sulphur trioxide, and a moving liquid, all of which will affect the corrosion resistance. Sulphur trioxide tends to attack silicon in gray iron as well as in the high-silicon cast irons, hence the low-silicon, low total carbon gray and austenitic type irons appear to be preferable. Possibly some of the highly alloyed materials may be necessary to give the desired corrosion resistance in your particular case.

Gives Possible Trouble Cause

Q.—We are sending you a small sample of bronze casting which is porous, and the surface impregnated with sand. The casting was poured during the month of February during an intense cold spell. We thawed the mold and hardened it with a torch. However, we still ended up with a casting of this type. Can you tell us the cause?

A.—The specimen forwarded to us shows the gas penetration clearly enough, but since it has been machined on four faces, and saw cut on the other two, there is no evidence of the sand trouble. However, we can only guess as to the possible cause of the trouble, and surmise that it was due to the torch drying operation on the frozen sand. You probably would have obtained a sound casting if you had poured into the frozen mold—sounds far-fetched, but actually that has been done without any ill effect on casting or pourer.

We suspect that the torch drying operation only penetrated under the skin of the mold, and in doing so the bond was partially destroyed since the sand was not designed for skin drying. Additionally the mold was only thawed back of the dry portion for a short distance. Hence, when the hot metal was poured the weak sand began to wash or erode. The hot metal heated the sand back of the dry face, generating steam in the moist, thawed sand—steam which could not escape through the frozen sand behind, and it kicked back into the mold cavity. The steam agitated the partially molten metal, causing the mixing of sand and metal as well as resulting in penetrating the metal.

Dry Molds with Infrared Rays

Q.—We operate a small foundry in Mexico and cast both steel and gray iron in oven-dried molds. We have tried infrared drying on cast steel molds without success. Molds were dried up to 2 hr, but apparently the drying was not deep enough as the castings were lost due to blows. Can you tell us if infrared lamp drying is being used successfully for iron and steel mold drying?

A.—Drying of molds with infrared incandescent lamps is being used to some extent in this country, but as far as we know, the practice is restricted to what might be termed skin-drying. That is, the depth of drying usually is up to 1 or 1½ in. According to data presented the lamps will dry to a depth of 1 in. in 1 hr, and to 1½ in. in 90 minutes. Undoubtedly, a mold could be dried completely by use of infrared lamps if sufficient time were allowed. While the figures given indicate that drying is accomplished at the rate of an inch per hour, we believe that it will decrease with the thickness since sand is a relatively poor conductor of heat when dry.

Figures given are for 110-v, reflector-type, 250-w lamps connected in series on a 220-v circuit with the lamps mounted on 6-in. centers. Lamps usually are 2 in. above the mold joint, but may range from 3 to 12-in. from the surface to be dried. To obtain a totally dry mold in a reasonable time we believe it would be necessary to use infrared lamp banks on all sides rather than on only the top or open side of the mold since the heat rays from the lamps travel in straight lines from the reflector. Hence, it would appear that

ANSWERS

if you want to use electric power for complete drying of molds, it would be more economical to employ a furnace equipped with resistors to convert the power into heat.

One article on the use of infrared lamps for mold drying appeared in the April, 1942 issue of THE FOUNDRY under the title "Green Sand Molds Dried by Infra Red Lamps" by L. M. Duryee, and a similar article by the same author entitled "Infra-red Lamps Dry Green Sand Molds for War Castings" appears in the 1943 *Transactions* of the American Foundrymen's Society.

Coupon Must Be Fed Properly

Q.—We are sending a tensile test bar cut from a coupon attached to the face of a manganese bronze propeller. The propeller was made from ASTM B 30-45T No. 8A (SAE 43) ingot melted at 1900° F in a gas-fired open-flame furnace; 3 per cent zinc being added to make up melting loss. A short flare prior to tapping has been standard practice. Metal was cast at 1860° F into an oven-dried sand mold. The yellow spots seen on the fracture faces of the tensile specimen are not generally noted in gates and risers fractured for examination. Tensile strength of this specimen was 64,250 psi as against a normal 77,000 psi for this alloy. We would appreciate a discussion of these yellow areas with a view to preventive measures to be taken against them in the future.

A.—The yellow areas in the fractured tensile specimen are shrink areas caused by lack of proper feeding, and of course, that is the reason you fail to find them in specimens cut from gates and risers unless they are taken adjacent to the pipe or sink—or in well fed separately cast test specimens. The remedy, naturally, is to locate the test coupon in such a position that it will be fed properly. You might try various locations until one is found that will produce a solid coupon every time. Possibly the use of a thin slot core as the connection between coupon and casting will aid in providing a sound test piece.

Manganese High for Malleable

Q.—In our foundry in India we are making blackheart malleable iron in a crucible furnace with carbon 2 to 4 per cent, silicon 1.1 per cent, manganese 0.8 per cent, phosphorus 0.2 per cent, sulphur 0.06 per cent and copper 3 per cent. We are not getting a bend over 70° on a ⅜ x 1 x 6-in. bar over a 1-in. radius. We would like to have your advice with regard to a composition with manganese as high as 0.8 per cent, as our pig iron is high in manganese. Our annealing cycle in a muffle furnace for the above composition is 1000 to 1700° F 4½ hr; at 1700° F 2½ hr; 1700 to 1400° F in 2½ hr; 1400 to 1200° F 8 hr, and 1200 to 1000° F. We would like to have information on composition, annealing cycle, etc. for crucible as well as cupola melting.

A.—With the relatively high manganese content in your crucible blackheart malleable, the product is a type of pearlitic malleable, and undoubtedly contains considerable pearlite as well as ferrite and temper carbon. Manganese retards secondary graphitization, and to obtain the regular blackheart structure of ferrite and temper carbon, the manganese usually is held to 0.25 to 0.35 per cent. With your high-manganese pig iron, little can be done as far as crucible melting is concerned since losses in elements will be low.

If cupola melting can be substituted, there will be a loss around 20 per cent in manganese, but even then only about 50 per cent pig iron could be used to keep the manganese within the range of 0.40 to 0.65 per cent usually present in cupola malleable. Other elements are 2.80 to 3.30 per cent total carbon, 1.10 to 0.60 per cent silicon, less than 0.20 per cent phosphorus, and less than 0.25 per cent sulphur.

The annealing cycle you indicate evidently is some type which we term "short-cycle," and also appears to be for small quantities of light section castings since the rates of change are rather rapid, or possibly they are data obtained from laboratory work. Nearest approach to such cycle in this country is obtained in a zone type continuous furnace where the castings are moved through the furnace. Cycle is 2½ hr at

GANGWAY!

By J. A. PATTERSON

"Yes, Mam, it's all very simple—we just dump in a mess of sand, pour in some of that red stuff, an' out comes a cute, perfect casting!!"

Questions AND ANSWERS

1700° F; cool to 1475° F in 2 hr; slowly cool from 1475° F to 1200° F in 6 hr, and then cool to handling temperature in 1 hr. Another short cycle anneal involves holding at 1725° F for 10 hr; cool to 1425° F in 2 hr; cool from 1425° F to 1300° F in 12 hr, and then to 1250° F in 2 hr.

Making Bronze Permanent Mold

Q.—In our local YMCA we have many boys who like to play chess, and from time to time lose one of the pieces which makes the whole set useless. Hence, we have to buy another set. Would it be possible to make a set of bronze molds in which aluminum or even lead could be poured to make sets of chessmen?

A.—We do not know whether a bronze mold will be satisfactory for making aluminum castings, but it will be all right for lead, zinc, etc. Such molds usually are made in plaster of paris or gypsum cement using the type known as casting plaster. For your purpose, it will be better to obtain the type already mixed with fibrous talc rather than to try to compound the mixture yourself, since you will not need a large quantity.

You will need patterns or models of the various chessmen in wood, clay or other material. Naturally to obviate necessity of a several-part mold you will have to eliminate any undercuts in the patterns so that the plaster mold can be lifted or drawn away without breakage of the edges. Making the final mold in which the bronze is cast requires several steps.

First of these is to mount the patterns in a follow board of some type so the proper parting lines are established. We speak here of patterns assuming that you will have several different ones in a mold rather than an individual mold for each pattern or piece. Then the patterns and board are given a thin coating of a parting compound such as lard oil, paraffin oil, liquid soap, petroleum jelly thinned with two parts kerosene, etc. A flask of sufficient size is placed around the board to allow 1½ to 2 in. all around. The flask is filled with liquid plaster which has been prepared carefully according to the manufacturer's directions.

Liquid plaster in the flask should be vibrated or tamped with a stiff bristle brush to be sure that there are no air bubbles at the plaster-pattern interface. Mold is allowed to set for 20 to 25 minutes when it hardens sufficiently to be handled although still moist. Mold is separated from patterns and board, or if the patterns are not fastened too tightly to the board, the board is removed, leaving the patterns in place in the mold. Patterns in the mold and mold face are coated with parting compound, a flask of the same size placed on top of the mold, and the other half mold made. After the plaster sets, the two halves are separated carefully, and the patterns and flasks removed. While the plaster is still damp and workable, the gates or risers are cut into the cavities. Since the bases of the chessmen will be the heaviest section we believe that will be the best location for the gate which also forms the riser.

Four sides of the half-molds are scored deeply also while damp to provide an anchor for the operation of making the sides for the production of the bronze mold which will be described shortly. Now put the two half-molds together after coating the faces with parting compound, and cast two sets of plaster patterns. Hold those until later. Then take a rectangular piece of wood which is as thick as the desired bronze mold, and make it the same length and width as the face of the plaster mold. After coating it with parting compound, place it on the mold, and surround the whole with a flask allowing at least 3-in. space all around. That is filled with plaster.

After the plaster has set, the wood block is removed and, as you can see, you have a mold with a rectangular cavity. The same procedure is followed with the other half mold. When those are finished, place molds and plaster patterns previously made in an oven at a temperature of 400 to 450°F and bake for 15 to 20 hr to drive off all moisture. Allow the parts to cool in the furnace to about 150°F before removing. Place a set of patterns in each half mold and pour the bronze into each. No cope will be necessary. The plaster molds should not be allowed to cool down since they will absorb moisture rather quickly, resulting in blows. Hence, molds and patterns should be left in the oven until the bronze is ready for pouring. With the bronze molds made, you can go ahead and make the chessmen in sets or individually.

Polished Surface Shows Spots

Q.—Under separate cover we are sending you a brass entrance door handle which we manufacture, and you will notice that there are several spots in the top plate of the assembly. One party claims that those are caused by iron in the metal. Castings are made from matchplate patterns, and while we have made thousands, we only get this condition once in a while on various parts of the handle. The castings, as you will note, are polished all over. Procedure is to run the polished and buffed parts through a bath of cleaner, then through a lacquer tank, and into an infrared baking oven for about 30 minutes.

A.—While the spotted areas on the casting submitted for examination might lead the uninitiated to the opinion that they are caused by iron, due to the rusty brown appearance, the facts are otherwise. The spots result from improper removal of the buffing compound which reacts with the lacquer to form a discolored material. You will find that if you strip the lacquer from the defective parts, rebuff, and make sure that all the buffing compound is removed, that the pieces will not show any spots when relacquered.

If iron were present, it would be in the combined form or as free iron particles, or both. When in the combined form, and in some brasses it may run as high as 0.75 per cent, its presence is not detectable by

(*Concluded on page* 102)

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ROYER FOUNDRY & MACHINE CO.

159 PRINGLE ST., KINGSTON, PA.

Questions and Answers

(*Concluded from page* 100)

appearance. In the free form it would show up as hard bright steely particles in the polishing and buffing operations and, of course, after the lacquering, although there is a possibility with some cleaning agents that the color of the iron particles might be on the gray side.

Prevent Rock Candy Fracture

Q.—We have seen references to intergranular or "rock candy" fracture occurring in steel castings, and would like information on how it can be prevented or eliminated.

A.—Intergranular or "rock candy" fracture is believed to be caused by aluminum nitride formation, and it is only when the amount of aluminum is excessive, resulting either from segregation or from promiscuous use on deoxidizing, that a steel of normal nitrogen content will show susceptibility to intergranular fracture from nitride precipitation. Normal range of nitrogen in steel, according to Lorig, is from 0.005 to 0.008 per cent. Investigation indicates that nitrogen content of steel may be held to the normal range by a vigorous boil and thorough oxidation during that period.

Detailed discussion of the various factors involved in intergranular fracture is contained in "Causes and Prevention of Intergranular Fracture in Cast Steel," by C. H. Lorig, *Proceedings,* Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers, 1945, and "Occurrence of Intergranular Fracture in Cast Steels" by C. H. Lorig and A. R. Elsea, *Transactions,* American Foundry men's Society, 1947.

Titanium additions have been used to alleviate intergranular fracture, but Lorig states that its advantage only appears when it is used as a deoxidizer, replacing a chemical equivalent amount of aluminum. In the discussion of Lorig's paper in the *Proceedings,* Electric Furnace Steel Conference, it was pointed out that trouble from hair line cracking and intergranualr fracture was eliminated by the following procedure: Furnace charges so constituted as to melt down at 0.40 per cent C or higher, thus making a minimum C drop of 0.25 per cent mandatory; and addition of 0.05 per cent Ti in the form of high-carbon FeTi was made in the ladle at tap; aluminum additions made after Ti addition were decreased from 0.125 to 0.075 per cent.

Hole Caused by Gas Injection

Q.—We are sending you a section broken from a flanged casting which contains a large gas or shrink cavity. As you will note, the cavity is at the juncture of the flange and body, and the only way we can detect its presence is by the extremely small hole at the junction. An enclosed drawing shows the method of gating the casting. Iron analysis shows 2.27 per cent Si, 0.102 per cent S, 0.357 per cent P, 0.73 per cent Mn, and 3.49 per cent TC. Sand has a moisture content of 7 per cent, and a permeability of 40.

A.—In this particular instance the method of gating or the composition of the iron has nothing to do with the blowhole or cavity found at the junction of flange and body of the casting. It is the old story of the re-entrant angle where the gases developed are large for the volume of sand involved, and do not escape rapidly enough. Those gases come off perpendicular to the surfaces which are at right angles to each other, and tend to strike back on the diagonal into the casting.

Moisture content of your sand seems to be high, and the permeability a little low. Changes in either should eliminate the trouble. However, if the trouble only occurs occasionally, it might be due to tramp iron, wood, etc., which lodges at the point in question and causes the blow. Another possibility is clay or sand balls resulting from poor mixing of the molding sand.

As far as your gating method is concerned, we believe that the single riser attached to the outside edge of the flange is of little value unless it is for the purpose of informing the pourer when the mold is full—and in that case it can be quite small. If the four branch gates leading to the inner side of the flange have the same cross-sectional area as the casting at that point, and the sprue area equal to the sum of the areas of the branch gates, feeding should occur without trouble. If you have difficulty in breaking off the branch gates in that they tend to tear into the casting, use thin cores with a small slot or hole at the point of attachment.

Compounds Increase Feeding

Q.—We will appreciate some information and details on "heading compounds" used to prevent shrinkage of castings and ingots. We also would like to have the same information on exothermic compounds used to generate heat and as covers on castings.

A.—The two types of heading compounds or riser compounds, as they are termed here, are being used to an increasing extent in this country to extend the feeding period of the risers. One type is mainly an insulating material such as diatomaceous earth, which is placed on top of the riser to prevent egress of heat. It may or may not contain carbonaceous material such as graphite or powdered coal, depending upon whether or not the presence of carbon will be deleterious to the alloy being used; for example, in the case of steel, the carbon pickup may be objectionable.

The exothermic type of riser compound is composed of metallic oxides and sized aluminum powder. In the case of plain carbon steels, the material may be iron oxide and aluminum powder, but where alloy steels are involved oxides of chromium, nickel, etc., are included as well as iron oxide. In this country practically all of the riser compounds are proprietary materials, and the names of the manufacturers as well as their addresses may be found in the advertising pages of THE FOUNDRY.

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A-1920

Men OF INDUSTRY

B. D. CLAFFEY, recently executive vice president and general manager, Acme Aluminum Alloys Inc., Dayton, O., has been elected president, succeeding **Karl A. Stein** who has been named chairman of the board of directors. **Robert J. Stein** has been named a member of the board, succeeding **George H. Stein,** who continues as vice president. **R. C. Crouch** has been re-elected secretary, treasurer, and director. Mr. Claffey entered the foundry industry in 1915, at Spring City Foundry, Waukesha, Wis., where he worked as laborer, coremaker, molder and superintendent. In 1928 he became foundry adviser, Wisconsin Motor Co., Milwaukee, and from 1930-1933 he was works manager, Milwaukee Gray Iron Foundry Co., Milwaukee. About that time he organized the Claffey Castings Co., Waukesha, which became the gray iron division of General Malleable Corp., in 1936. He was a director and manager of that division until 1947 when he became vice president-general manager, Acme Aluminum Alloys Inc. A former president of the Wisconsin Chapter of the American Foundrymen's Society, Mr. Claffey has served as a national director of the AFS and has just been elected vice chairman of its Educational Division. He is also vice president of the Foundry Educational Foundation.

Ernest E. Graham of E. E. Graham & Co., Houston, Tex., has been appointed sales representative in Texas, Oklahoma and Louisiana for the Cooper Alloy Foundry Co., Hillside, N. J. Mr. Graham, after completing his studies at Texas University, spent 14 years with the Reed Roller Bit Co., Houston, before opening offices as a manufacturer's representative.

* * *

V. S. Spears, elected chairman of the Michiana Chapter of the American Foundrymen's Society for the year 1949-50, is Indiana representative, American Wheelabrator & Equipment Corp., Mishawaka, Ind. Mr. Spears attended Iowa State College and then spent 4 years in manufacturing planning at the Hawthorne Works of Western Electric Co., Chicago, and 3 years in consulting engineering. In 1936 he joined American Foundry Equipment Co., which later became American Wheelabrator & Equipment Corp., and was appointed Indiana representative 3 years ago. Mr. Spears has served as secretary-treasurer of the Michiana Chapter for the past 8 years.

* * *

Harold J. Roast has resumed his practice as consulting chemist and metallurgist with headquarters at 15 Church Hill, Westmount, Que., Canada. Mr. Roast formerly was president and general manager of the National Bronze Co., Montreal. When that organization was purchased by the Robert Mitchell Co. Ltd. in 1928, Mr. Roast was retained as metallurgical director until 1933 when he became associated with the Canadian Bronze Co. as technical adviser. Two years later he was appointed vice president from which position he retired in 1947, becoming a consultant to the company. Mr. Roast is a past national director of the American Foundrymen's Society.

* * *

F. L. LaQue has received the Frank Newman Speller Award in Corrosion Engineering of the National Association of Corrosion Engineers, presented annually in recognition of outstanding contributions in science and engineering in the field of corrosion. Presentation of the award was made at the annual banquet of the association at the Netherlands-Plaza Hotel, Cincinnati, Apr. 13, by Dr. Frank Newman Speller. Mr. LaQue is in charge of the corrosion engineering section of the Development and Research Division, the International Nickel Co. Inc., New York.

* * *

Simon D. den Uyl has been elected president, Bohn Aluminum & Brass Corp., Detroit, succeeding **Peter A. Markey,** who has resigned. **Emerson Frantz** has also resigned as vice president and general sales manager. **R. J. Rishirt** has been elected vice president and **F. M. Taylor** has been named treasurer. Other appointments include **C. M. Adams,** secretary; **V. C. Marowca,** assistant secretary; and **R. J. Warner,** assistant treasurer.

* * *

J. B. Neiman has resigned as general manager, General Aluminum Department, Federated Metals Division, American Smelting & Refining Co., New York. Mr. Neiman has

(*Continued on page* 106)

B. D. CLAFFEY

ERNEST E. GRAHAM

V. S. SPEARS

HAROLD J. ROAST

How to put new life into old sand

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It's flexible. Its slope is adjustable from horizontal to 28° to suit changing load requirements.

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ROBINS CONVEYORS DIVISION **HEWITT-ROBINS INCORPORATED**

Men OF INDUSTRY

(*Continued from page* 104)

been associated with Federated Metals and its predecessor companies in various executive capacities since 1911. His headquarters will continue to be at 729 Fisher Bldg., Detroit, and further details of his plans will be announced later.

* * *

Clarence J. Stewart has been appointed field sales manager, the Federal Foundry Supply Co., Cleveland. Mr. Stewart, a graduate of Susquehanna University, completed postgraduate work at University of Pittsburgh, Carnegie Institute of Technology and Pennsylvania State College. Previous connections included Carnegie-Illinois Steel Corp., Pittsburgh, where he supervised sand control, melting, industrial relations and the electric foundry; plant manager, Bardes Forge & Foundry Co., Cincinnati; superintendent, Cleveland Foundry Co., Cleveland; and a year and a half in the foundry consulting field. Mr. Stewart is a member of American Foundrymen's Society and American Society for Metals.

* * *

Robert L. Baldwin has been appointed assistant to G. A. Wallerstedt, western district manager for Hardinge Co. Inc., York, Pa., producer of pulverizing, drying and water treatment equipment, with headquarters at the company offices in San Francisco. Mr. Baldwin joined American Steel & Wire Co., Cleveland, in 1901 as a technician. Following a position as special agent, Hudson Underwriters, New York, he became a special representative for United States Steel Corp., in 1912, for electric steel furnaces. He became associated with Republic Carbon Co., Niagara Falls, N. Y., in 1920, as manager of sales, and in 1934, when that company was acquired by National Carbon Co. Inc., there, he was appointed sales development manager of the electrode division.

* * *

Harrison Taylor has been appointed sales engineer in the New York district office, Whiting Corp., Harvey, Ill., succeeding **A. R. Binckes** who recently was transferred to Los Angeles. Mr. Taylor will work under direction of D. Polderman Jr., vice president and export manager, who is also in charge of the New York district office. He has been associated with Whiting Corp. at the main office and plant in Harvey since 1938, as an engineer and estimator in the railroad products department.

* * *

R. E. Valk has been appointed works manager of the Toledo, O., plant, the National Supply Co., Pittsburgh, succeeding **L. A. Ringman** who has resigned. Mr. Valk joined the company in 1938, following graduation from University of Michigan with a degree in mechanical engineering. He was successively student engineer, experimental engineer, draftsman and gear engineer, and production engineer in Toledo. He was appointed manager of the Houston, Tex., plant in 1945 and returned to Toledo last year as assistant works manager.

* * *

Paul J. Welsh has joined the research staff of E. F. Houghton & Co., Philadelphia, manufacturers of industrial oils, chemicals and leathers. Mr. Welsh, a graduate of Carnegie Institute of Technology, was formerly on the development staff of B. F. Goodrich Co., Akron, O.

* * *

Berton M. Sharpe has been appointed sales engineer in southern Indiana, southwestern Ohio and northern Kentucky for the Standard Furnace Division, Surface Combustion Corp., Toledo, O. Mr. Sharpe attended Ohio State University and University of Southern California. Since joining Surface Combustion Corp. in 1937 he has been engaged in engineering and service work in industrial, aircraft and space-heating fields. During the war he was loaned to Curtiss-Wright Aircraft Corp., Dayton, O., and subsequently served as civilian technical representative with the Army Air Force in China and India for a year.

* * *

R. P. Colosi, formerly office manager of the Buffalo district sales office, the Carborundum Co., Niagara Falls, N. Y., has been appointed Cleveland district office manager, succeeding **H. P. Erbe,** who was recently appointed office manager in Pittsburgh. **H. E. Morrill,** who has been supervisor of branch inventories, succeeds **R. J. Nemec** as Chicago district office manager. Mr. Nemec has been appointed St. Louis district office sales manager and **A. L. Fischer,** who has been sales manager there, will assume other duties with the St. Louis office organization.

* * *

Eric G. Skarin, formerly metallurgist, the Midvale Co., Philadelphia, has been appointed service metallurgist, the Ohio Ferro-Alloys Corp., Canton, O. Mr. Skarin, following a training course at Bethlehem Steel Co., Bethlehem, Pa., served in its open-hearth department for 14 years prior to joining Midvale Co.

* * *

James L. Erickson, James L. Erickson Sales Inc., Dayton, O., recently was appointed sales engineering representative for the Aurora Metal Co., Aurora, Ill. Mr. Erickson's territory includes southern Ohio and southeastern Indiana in the sale of the company's aluminum bronze and

(*Continued on page* 109)

CLARENCE J. STEWART

ROBERT L. BALDWIN

HARRISON TAYLOR

R. E. VALK

A cyclone and a Sly Dust Filter collect dust from grinding and sandblast operations on non-ferrous castings. The Sly Dust Filter is needed to collect completely all the fine dust which the cyclone could not catch.

SLY DUST Control

Gets ALL the Dust —EVEN THE VERY FINE DUST

it is the FINE DUST which does the damage . . .

The *fine dust* works its way into the bearings and other moving parts of machinery and settles widely over plant and neighborhood.

Only the *fine dust* is injurious to the human body. The coarser particles are stopped by the nose and mouth; only the very fine particles enter the respiratory system.

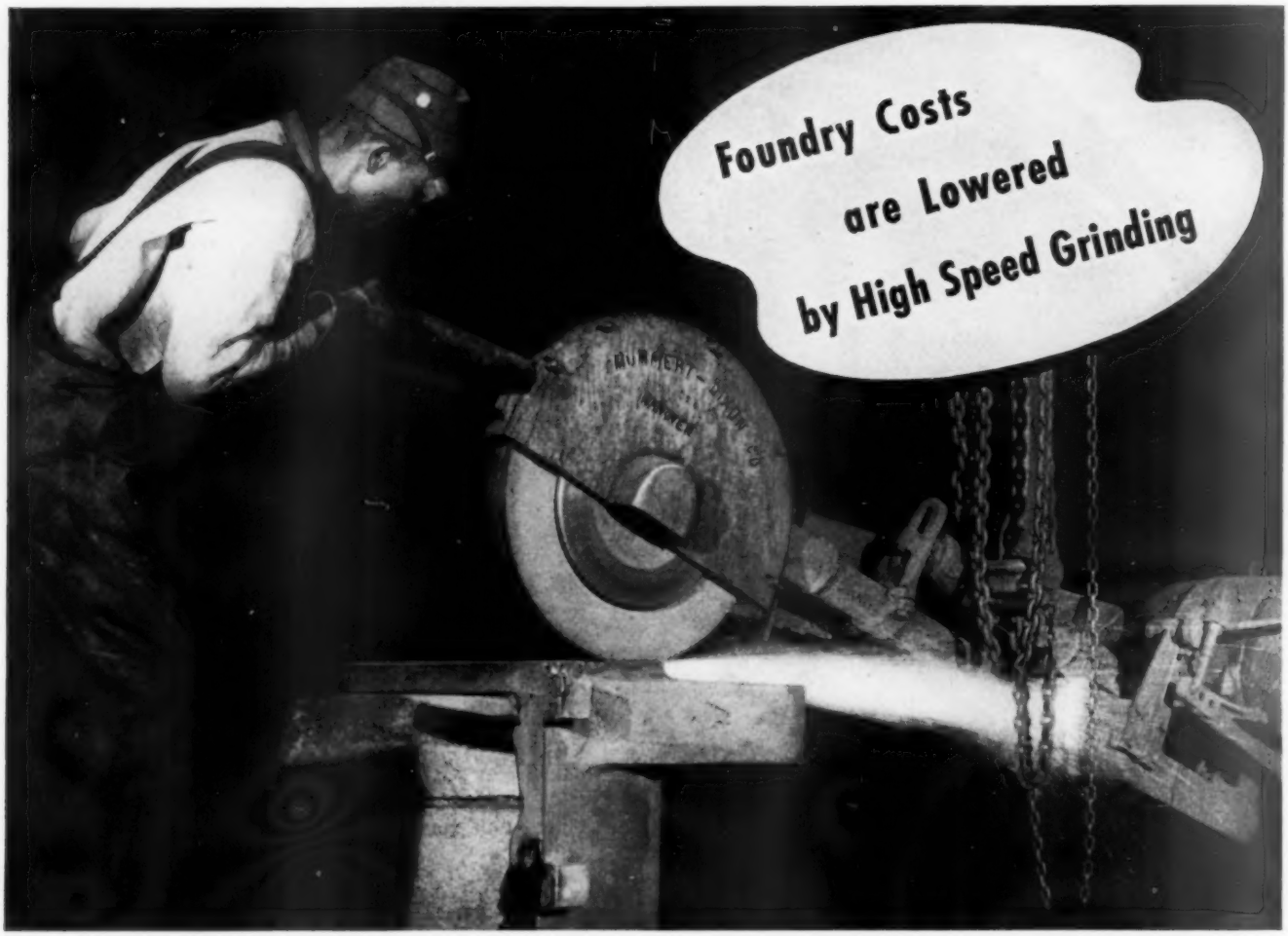
A combination of a Sly Dust Filter and a cyclone Collector is not uncommon. Often the cyclone does not collect the fine dust. Then a Sly Filter is added to get it all.

Sly Dust Collectors are not expensive —in first cost, maintenance, operation. Ask for Bulletin 98 and tell us your problem so that we can write you fully.

THE W. W. SLY MANUFACTURING CO.

4753 TRAIN AVENUE • CLEVELAND 2, OHIO

Representatives in New York • Chicago • Philadelphia • Detroit • St. Louis
Toronto • Minneapolis • Cincinnati • Rochester • Los Angeles • Birmingham



with MANHATTAN ABRASIVE WHEELS

Fast metal removal for sustained periods with a wheel that doesn't load or glaze is the foundryman's ideal. Manhattan Abrasive Wheel Engineers achieve this ideal by custom tailoring wheels for *your* work. Whatever the metal removal problem may be, Manhattan's experience comes to your aid in reducing your costs.

MANHATTAN CUT-OFF WHEELS — Manhattan Cut-Off Wheels make cool, quick cuts . . . and many more per wheel. Here again, Manhattan follows its policy of custom tailoring the type and size of wheel to solve any perplexing cut-off problem. Manhattan Cut-Off Wheels constantly achieve new records for number of cuts per wheel . . . with uniformly high quality of cut. Manhattan Cut-Off Wheels are the "pay-off" wheels for you.

Exclusive Manhattan developments and constant laboratory tests of both Rubber and Resinoid Bonding insure wheels that last longer and produce better results in less time. Thus, your costs are lowered 3 ways.

MORE PRODUCTION
per Shift on your
PORTABLE GRINDERS
with Manhattan's
VIBRATION ABSORBING
RUBBER BUSHING

The Manhattan VDB Wheel (U. S. Patent No. 2,187,350) is a boon to operators and management alike. Fatigue and nervous strain caused by vibration, chatter and jumping of the grinder are eliminated. More production and greater accuracy are the results, with minimum of wear and tear on man and machine.

ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

(*Continued from page* 106)

silicon bronze vacuum die castings. The Aurora company also announces the appointment of **R. A. Egelhoff** and **E. H. Poling** of E. Metal Sales Inc., St. Louis, as its sales engineering representatives in southern Illinois, Missouri, Kansas, southeastern Iowa and Evansville, Ind.

* * *

Changes in the top executive staff of the Dow Chemical Co., Midland, Mich., have been announced as a result of the death of Dr. Willard H. Dow, Mar. 31, in a plane crash near London, Ont. **Earl W. Bennett** has been elected chairman of the board of directors, **Leland I. Doan,** president, and **Dr. Mark E. Putnam,** general manager. **Dr. A. P. Beutel** and **Russell L. Curtis** have been named vice presidents, **Carl A. Gerstacker,** treasurer, and **Calvin A. Campbell,** secretary

* * *

William A. Muth Jr. has been appointed Ohio representative, the Wellman Bronze & Aluminum Co., Cleveland, and will handle sale of the company's magnesium, aluminum, bronze, permanent mold and sand castings, wood and metal patterns. Mr. Muth was graduated from John Carroll University in 1936, when he became associated with White Motor Co., Cleveland. He was engaged for 8 years in production and sales work with P. A. Geier Co. and National Bronze & Aluminum Foundry Co. there and until recently was vice president-general manager, the Aluminum Permanent Mold Co., also of Cleveland.

* * *

Charles A. Freeman, until recently associated with A. P. Green Fire Brick Co., Mexico, Mo., has organized his own company at Canyon City, Colo. The new corporation will acquire clay deposits, buildings and equipment now located there. Mr. Freeman, a graduate of the Missouri School of Mines, has been associated with the A. P. Green organization in various sales and engineering capacities since 1928, and has been instrumental in developing the use of Missouri fire clays for blast furnace service.

* * *

Richard S. Moore, has been appointed manager of basic sales, Harbison-Walker Refractories Co., Pittsburgh. A graduate of University of Illinois, Mr. Moore joined Harbison-Walker in 1929, at the Hays, Pa., works where he later became foreman. He was transferred to the sales technical department of the Pittsburgh sales office and in 1940 became head of the basic sales department where he specialized in insulating refractories.

* * *

O. L. Earl, vice president, Acme Aluminum Foundry Co., Chicago, has been named chairman of the Associates Committee, American Washer & Ironer Manufacturers' Association, for the current year. **H. P. Nelligan,** president, Easy Washing Machine Corp., Syracuse, N. Y., is president of the association.

* * *

Arthur A. Batts has retired as chairman of the board of directors, Carborundum Co., Niagara Falls, N. Y., following 48 years with the company. Mr. Batts served as president of the company from 1942 to 1947, and had previously been secretary and a director.

* * *

D. L. Swinnerton has been appointed executive vice president, Apex Steel Corp. Ltd., Los Angeles. Other appointments include **Robert S. Grover,** vice president-treasurer; and D. L. Robertson, vice president in charge of sales.

* * *

Adolf H. Schott, for 46 years superintendent of the foundry and machine shop, Standard Brass Works, Milwaukee, has retired. Mr. Schott was associated with Johnson Service Co., Milwaukee, for 4 years, and joined Standard Brass Works 50 years ago as a metal pattern maker, later working in the foundry and machine department, where he became superintendent. A member of the Wisconsin Chapter of the American Foundrymen's Society, he was honored recently at an Old Timers' dinner given by the chapter.

* * *

Donald L. Colwell, sales engineer, Apex Smelting Co., Chicago, has returned from abroad. Mr. Colwell and **Albert Butler** of Denver, were sent to six European countries by the Economic Co-operation Administration to examine aluminum requirements of Europe.

* * *

Walter H. Winter, assistant secretary and assistant treasurer, Symington Gould Corp., Rochester, N. Y., has retired. Mr. Winter has been associated with the company since 1929. Prior to that he was connected with American Steel Foundries, Chicago.

* * *

J. H. Denton has been appointed manager of sales administration, in the home office of the Carborundum Co., Niagara Falls, N. Y., succeeding **D. S. Masson** who recently became assistant to the district sales manager in Detroit.

* * *

Edwin S. Carman, founder and for 20 years president, Edwin S. Carman Inc., Cleveland, foundry engineers and consultants, has been elected chairman of its board of directors. **Thornton S. Carman,** also associated with the company for 20 years and

(*Concluded on page* 112)

LELAND I. DOAN

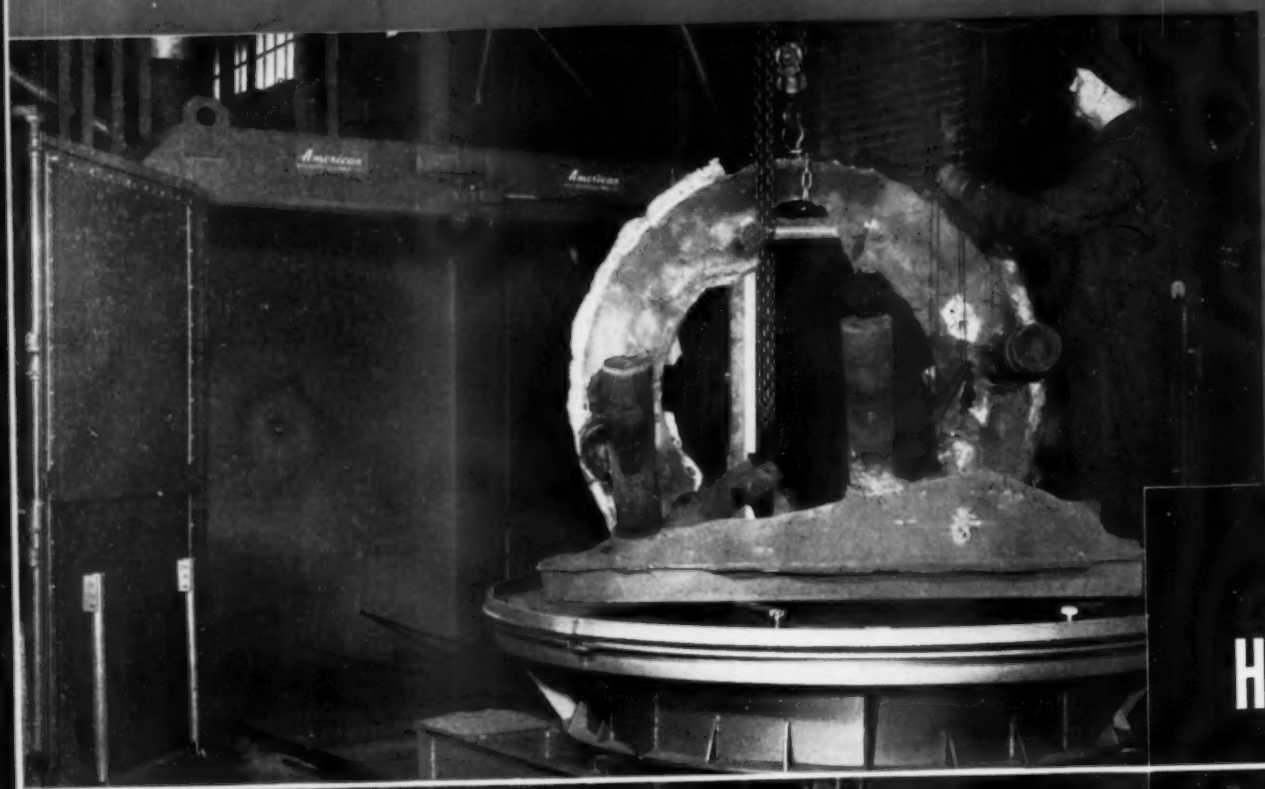
EARL W. BENNETT

DR. MARK E. PUTNAM

WILLIAM A. MUTH JR.

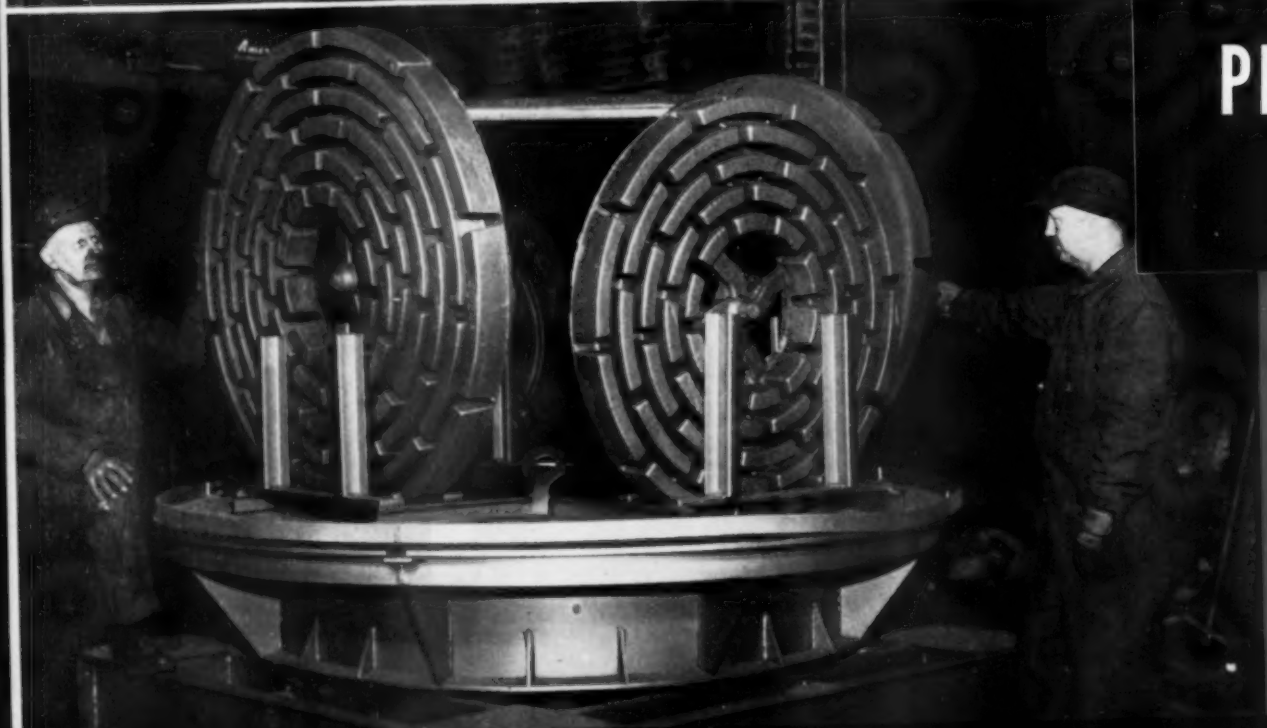
WHEELABRATOR®

CAR TYPE ROOM WITH ROTATING TABLE



This Wheelabrator Room decreased cleaning costs 36% at Love Brothers, Inc., Aurora, Illinois

HERE'S PROOF



These four castings were cleaned in 15 minutes in the Wheelabrator Room. Castings are 4 feet in diameter and weigh 975 pounds each.

SAVES $7,310 IN ONE YEAR ON ONE JOB

at Love Brothers, Inc., Aurora, Ill.

COSTLY AIRBLAST ROOM ELIMINATED

Those large, bulky jobs that now cost you so much to clean in an unhygienic airblast room can be handled far more quickly and economically in a Wheelabrator Room. Convincing evidence of this is shown in the case history reported below.

Consider also these *additional* advantages: less air is required for ventilation, the operator works outside the dusty atmosphere of the blast chamber, a simplified foundation is used, erection is much less costly, and power requirements are greatly reduced due to the elimination of compressed air.

Wheelabrator Rooms are designed in a variety of standard types and sizes to meet the requirements of shops large and small. Complete information will be sent to you without obligation. Write today.

Cost of Cleaning Runner Bars for Glass Grinding Machines at Love Bros., Inc.
Each bar is a grey iron casting 4 feet in diameter and weighs 975 pounds.

FORMER METHOD	WHEELABRATOR METHOD	SAVINGS
MACHINE Airblast Room	**MACHINE** Car type Wheelabrator Room with rotating 96" table. (5 ton capacity).	**CASH SAVINGS** — Per Piece $1.63. Per Ton $3.44. Per Day $29.24. Per Year $7,310.00.
CLEANING TIME 3 castings in 35 minutes	**CLEANING TIME** 4 castings in 15 minutes	**BETTER CLEANING** — The quality of cleaning is greatly improved. Costly chipping reduced by 35%.
CLEANING COST Per Piece $4.69 Per Ton $9.60	**CLEANING COST** Per Piece $3.06 Per Ton $6.16	**GREATER CAPACITY** — An additional 7 tons of large, heavy castings are Wheelabrated daily with approximately the same savings. **FASTER CLEANING** — Cleaning time is slashed 50%. **FASTER DELIVERIES** — Castings are shipped the same day they are poured.

American

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505 S. Byrkit Street Mishawaka 2, Indiana

New, informative book gives complete, concise information on all phases of airless blast cleaning. Write today for Catalog No. 74-A.

Men OF INDUSTRY

(*Concluded from page* 109)

who has acted as general manager for the last 5 years, has been elected president. The company's services have been exclusively in the foundry industry, in the United States, Europe, Latin America and Canada.

* * *

Changes in personnel of the Maumee Malleable Castings Co., Toledo, O., have been announced to broaden activities of that plant and of American Boiler & Foundry Co. and American Furnace & Foundry Co., recently acquired by the company in Milan, Mich. **E. H. Doering**, who joined the company in 1919 as production manager, became sales manager in 1922 and general manager in 1945, has been named executive vice president, and will devote most of his time to co-ordinating sales of Maumee Malleable and American Boiler & Foundry Co. **N. P. Mahoney** has been named plant manager at Maumee Malleable. He joined the company in 1920 and has served as purchasing agent, production manager and superintendent. **R. E. Bossert** has been appointed sales manager at Maumee Malleable. He joined the company 17 years ago and has been in charge of the pattern department since 1935. **H. M. Breese**, who has been with the company since 1928, has been named secretary of the new Maumee Malleable organization, in addition to being treasurer and purchasing agent.

* * *

Alex Cruickshank has been appointed plant engineer in charge of maintenance, McConway & Torley Corp., Pittsburgh. Mr. Cruickshank was graduated from Wentworth Institute and Franklin Institute, Boston, and took postgraduate work at Carnegie Institute of Technology and University of Pittsburgh. He was associated with the New England Metallurgical Corp., Boston, and with Jones & Laughlin Steel Corp., Pittsburgh, for 16 years prior to joining McConway & Torley Corp. During the war he served as superintendent of all bomb and shell finishing lines at the McKeesport, Pa., plant of Jones & Laughlin.

* * *

R. H. Olmsted has been appointed service engineer in the midwestern district, Whitehead Brothers Co., New York, with headquarters in Conneaut, O. Mr. Olmsted was graduated from Case Institute of Technology in 1939, with a degree in metallurgy. He was associated with Taylor & Boggis Foundry Co., Euclid, O., and Republic Steel Corp., Youngstown, O., until 1940 when he joined Farrel-Birmingham Co. Inc., Ansonia, Conn. He remained there 6 years working as a technical assistant engaged in research with sands, binders, core oils, heat-treating processes and cupola operations. In 1947 he became associated with Lake City Malleable Inc., Ashtabula, O., where he acted as laboratory and sand control supervisor. Mr. Olmsted is a member of the American Foundrymen's Society.

* * *

A. G. Hobson, Malden, Mass., has been appointed New England representative for Milwaukee Foundry Equipment Co., Milwaukee. Mr. Hobson has spent 25 years in the foundry industry, both in New England and on the West coast.

* * *

Hugh J. Pugsley has been elected vice president in charge of the combustion furnace division, Swindell-Dressler Corp., Pittsburgh. Mr. Pugsley, a native of Kitchener, Ont., was graduated from University of Toronto with a degree in engineering. He has been associated with the company for over 22 years, engaged in engineering and sales activities.

* * *

Henry Wardwell II has been elected assistant to the president, Burnside Steel Foundry Co., Chicago. Mr. Wardwell joined the company in 1934 and became a director in 1936. He returned to the company in 1945 following 4 years of Navy service.

* * *

M. W. Sledge has been appointed assistant manager of the belting sales department, Goodyear Tire & Rubber Co., Akron, O., succeeding the late W. P. Hallstein. Mr. Sledge has been with the company since 1935.

* * *

Harlow Scott has been appointed purchasing agent, Pratt & Letchworth Co. Inc., Buffalo, succeeding the late Paul J. Houck Sr. Mr. Scott had been assistant purchasing agent for several years.

* * *

E. F. Thum Jr. has been elected president of the Abrasive Alloy Castings Co., Bridgeboro, N. J. Mr. Thum had been serving previously as vice president and general manager of that organization.

* * *

Gordon Brown has resigned as foreman of the finishing room at the Indianapolis foundry of National Malleable & Steel Castings Co. Mr. Brown plans to establish his own business.

* * *

A. W. Simpson has been elected president and treasurer, Western Die Casting Co., Emeryville, Calif. **F. K. Hartenstein** has been named vice president and secretary.

* * *

Dr. L. M. Winn has retired as medical director, U. S. Pipe & Foundry Co. plant at North Birmingham, Ala., following 30 years of service there.

E. H. DOERING

ALEX CRUICKSHANK

R. H. OLMSTED

SAND CONTROL Yes

METAL CONTROL Yes

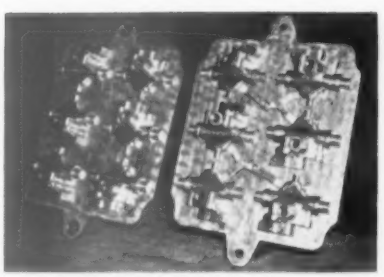
PATTERN CONTROL ?

IPW HELPS YOU GET IT!

The savings in time and scrap that foundrymen strive to achieve through careful sand and metallurgical controls are frequently wasted because of poor pattern control.

Sound pattern control simply means the use of IPW all-machined, properly engineered, high precision patterns that produce dimensionally accurate castings. It also means a sharp reduction in foundry time and machine time—in foundry scrap and machine scrap. It means faster production, better work, better profits. Precision patterns give you an edge competitively, too, because high production brings down costs and prices.

IPW invites your inquiry. We'd like to show you how to cut down those costly, day-after-day scrap and machine time losses. Write today.



Typical all-machined pattern. This one consists of six brass patterns mounted on cope and drag steel plates.

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PATTERNS FOR PRODUCTION · PATTERN ENGINEERING SERVICE

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CHICAGO 18, ILLINOIS

Man-to-Man

ON THE MOLDER'S BENCH

By RALPH L. LEE

"Mechanics and Humanics"

IF it keeps on going the way it has been, I don't believe there will be many who can say they have visited more foundries than I have. Just got back from a trip down through the deep South. Hadn't any idea there were so many foundries down there.

I think the thing that struck me most was that, in spite of the difference in climate, the way they toy around with their "Rs", the blackness of their coffee and their genuine Southern hospitality, their foundries on the inside look just about the same as the foundries up No'th, oveh East, out Wes' or somewhere in the middle.

Kind o' bouncing back and forth between these samenesses and differences, it struck me that there probably was no other kind of shop work in which the equipment, the tools and the materials were so nearly standardized as they are in our old foundry business.

I imagine that if some stranger, not too familiar with molding, was given the job of going around the country visiting foundries after quitting time for the purpose of trying to find out what made some click and others just creep along, he'd have one heck of a time just looking at the equipment and tools. He'd find the cupolas, furnaces, machines, conveyors, flasks, cleaning apparatus—yes, and even plant layouts—looking pretty much alike.

He'd probably find one foundry in a brand new building, laid out by efficiency experts with all the latest jim-cracks but not doing so hot. Then several blocks away another foundry, in buildings that just sort o' grew up by themselves, like Topsy, with equipment in them that had seen better days, not too good when it comes to layout, but, in spite of these disadvantages really going to town in the face of a general tapering off in business.

If this foundry visitor had his eyes open he'd see certain signs of the reasons behind the differences—like good-housekeeping and stuff put away where it belongs—but the reasons themselves would be hidden somewhere between the mechanical things he saw. With the plants shut up for the night and with everybody at home the only real reason for one foundry over-shadowing another would be missing.

I met a fellow on this last trip down through Texas who started me thinking along this line. And by the way, this Southern hospitality we Northerners hear so much about isn't just talk—I have never been so well met and treated so fine. He owned one of the foundries that had grown over the years like Topsy and was steaming right along full time with a full force.

He Even Built the Shop

He told me how he had started all by himself; he even put up his galvanized shed alone. He melted, molded, cleaned, delivered and sold. In telling me about it he made a big point of the fact that from the very beginning he never made a promise to any of his customers that he wasn't sure he would be able to keep. "Doc!" he said, "I've worked, many a time, 24 hours at a stretch, making good on a promise. When I say promise, I mean not only as to delivery dates, but as to metal, price and quality of castings."

Then he told me that when the orders piled up so he simply couldn't do the work by himself any more he had to face the fact that if he was going to stick to his promise making and keeping principle, it would have to be done from then on by the boys he had hired to help him. So he had to pick out the kind of fellows who were willing to learn how to do it and would do it after they had learned.

"But Jack," I said, "now that you have grown to the size you are, and carrying right on it spite of present conditions, do you mean to say that the main reason for it is this promise making and keeping thing you have been harping on."

"I sure do, Doc!" he said, "plus this—I have never yet made a promise to any of my boys that I didn't keep, and there is not one of them who will make a promise to me that he does not keep."

I stayed late in the foundry the last night of my visit, after the whistle blew, to watch the superintendent make a stone matchplate with one of the foremen as his helper. A pet customer of theirs simply had to have 34 castings by the next evening—they had promised to do it.

Through the grapevine I learned from reliable sources that, as far as they knew, not one of Jack's employees had ever been fired or quit. I also learned that they all shared in the results of keeping their promises. It's common gossip that the whole outfit has a code of personal honor as far as their work and their relationship together is concerned.

No sir, the mechanics of our foundry job is darned important, but the humanics is a darned sight more important, it seems to me. Now that I think of it, the five foundries I have visited in the past two months who are carrying right on full steam by some coincidence all have gangs that seem at least to feel toward each other, toward their work and toward their outfit pretty much like Jack's outfit feels.

When I left Jack he told me that if the plant should burn down (God

(*Concluded on page* 116)

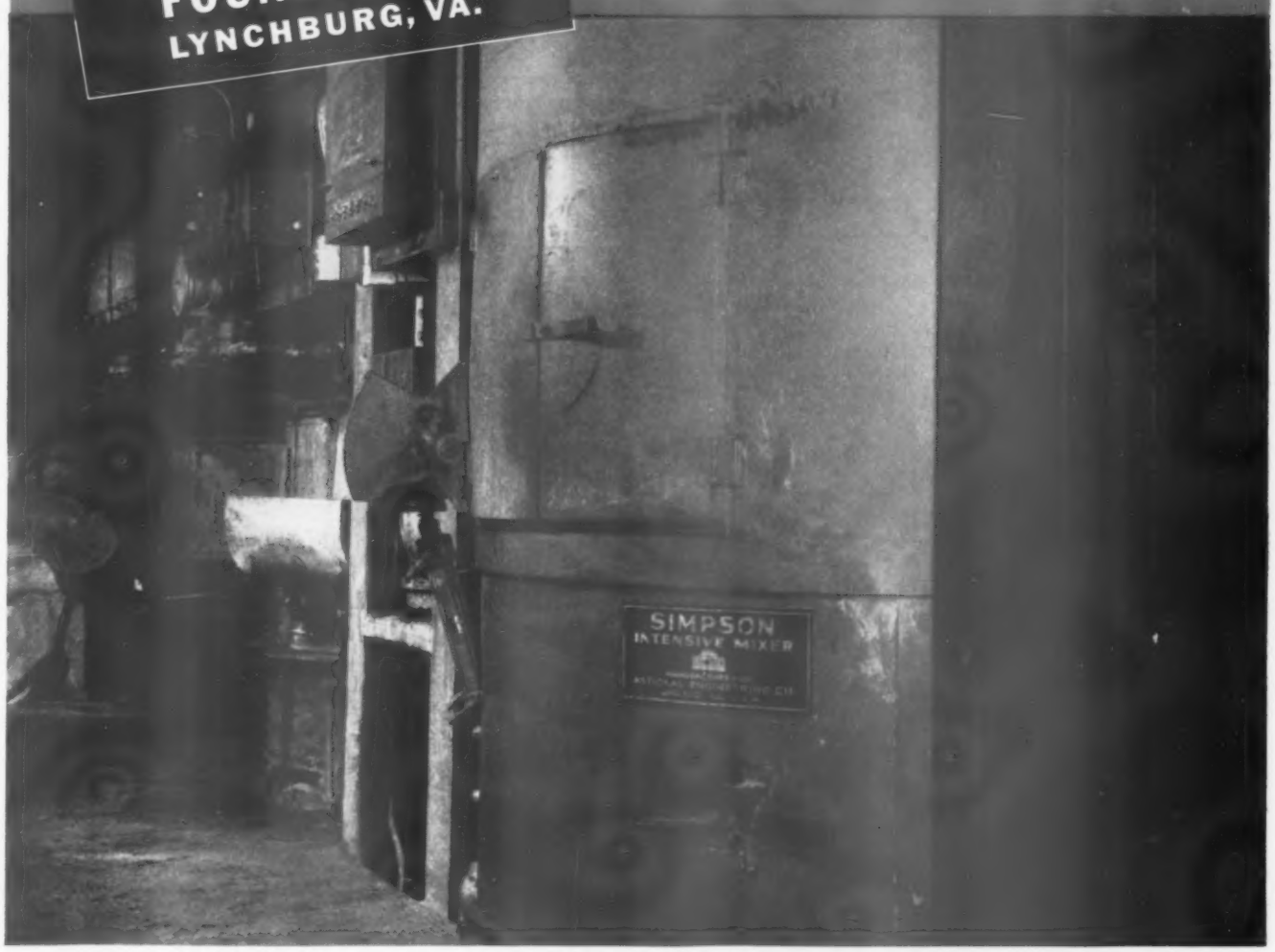
NEW No. 3 SIMPSON MIXER

Doubles Capacity

OF SAND PREPARING PLANT *at* LYNCHBURG FOUNDRY CO.
LYNCHBURG, VA.

IMPROVED SURFACE FINISH AND MARKED REDUCTION IN SCRAP LOSS RESULTED WHEN A NO. 3 SIMPSON MIXER WAS RECENTLY INSTALLED TO AUGMENT CAPACITY OF EXISTING UNIT.

TO FIT INTO LAYOUT TO BEST ADVANTAGE, THE SINGLE LARGE DISCHARGE DOOR ARRANGEMENT WAS USED. THE 50 CUBIC FOOT BATCH OF SAND WEIGHING SOME 3300 LBS. IS DISCHARGED IN 13 SECONDS.



SIMPSON MIXERS WILL HELP YOU TO IMPROVE YOUR PRODUCT AND REDUCE COSTS. YOUR NATIONAL ENGINEER WILL BE GLAD TO ASSIST IN PLANNING THE INSTALLATION.

SIMPSON Intensive MIXERS

NATIONAL *Engineering Company*

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Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney, Australia

(*Concluded from page* 114)

forbid) they'd be held up for a while, but it wouldn't be long before they were going full blast again IF he could keep his gang. It seems to me that the next great era of cost reduction, production and profit increase will be based upon employee relations—which is only another way of saying how employees feel toward their bosses in relation to how the bosses feel toward them.

Book Review

Ten Sections of the Modern Foundry Industry, by J. Sissener; 236 pages 7½ x 11½ in.; 184 illustrations; published by Studieselskapet for Norsk Industri (Society for Development and Research of the Norwegian Industry) Oslo, Norway.

Foundation of the report was a four-month trip to the United States in 1946 in behalf of a number of Norwegian and Swedish companies and the Department of Commerce, Oslo. Visit included 34 foundries and the foundry exhibition in Cleveland. Among the foundries were five steel foundries; three nonferrous metal foundries and the remainder gray iron foundries. The visits also included equipment companies. Material also was collected in 1946, 1947, and 1948, from foundries in England, Sweden, Finland, Denmark and Norway.

Features covered in the report include: Planning of foundries; roller conveyors and mechanized foundries; sand preparation systems; sandslingers; hydroblast wet cleaning of castings; mechanical charging of cupolas; the cement sand process; centrifugal casting; meehanite; electric melting; sand reclamation.

Although written in the Norwegian language, a general impression may be had by those who are familiar only with the English language. The preface and interpolations here and there are in English.

NEW WAREHOUSE and sales office has been completed in Detroit for Federal Foundry Supply Co., Cleveland. Constructed of aluminum siding on a steel frame, the L-shaped building provides 7000 sq ft of floor space part of which is radiant heated. The structure will be used for storing most of Federal's foundry products and will provide office space and manufacturing facilities for some items, such as foundry hand riddles, riddle bottoms, flaw swabs and skim gates. The building is located at 2507 24th St. on a siding of the Michigan Central Railroad

Plan Sessions for ASTM Meeting

American Society for Testing Materials has arranged 22 technical sessions for presentation of symposiums and numerous technical papers and reports at its 52nd annual meeting which will be held in Atlantic City, June 27 to July 1. Tentative program includes the following sessions of interest to those in the foundry and allied fields: Radiography; fatigue of metals; soils; spot testing; nonferrous metals, corrosion, fatigue, etc.; testing cast irons with SR-4 type of gage; steel, ferroalloys; fuels; accelerated testing of bituminous materials, water borne wastes; cementitious materials.

Annual Marburg lecture will be on the subject "Residual Stresses in Metals," by Dr. William M. Baldwin Jr., research professor and director of the metal research laboratory, Department of Metallurgical Engineering, Case Institute of Technology. All sessions are to be at Chalfonte-Haddon Hall.

Announces Foundry Training Film

Cooper Alloy Foundry Co., Hillside, N. J., has announced a training film, available to engineering schools, societies or clubs interested in foundry practices. The 22-minute 16-mm film, entitled "Molding on a Jolt Roll-over Pattern Draw Machine," was made at Cooper Alloy Foundry. A detailed explanatory instructor's manual is furnished with the film and serves as a stimulus for group discussion or review of the key points. Applications for use of the film, which is furnished free upon request, should contain date it is to be used, information as to type of group who will view it, and should be addressed to the company for the attention of Miss R. B. Kubert, Librarian.

Book Review

Proceedings, Vol. 48, 1948, published by American Society for Testing Materials, Philadelphia, cloth, 1354 pages, 6 x 9 in.

Published annually by the ASTM, the *Proceedings* include all reports and papers offered to the society during 1948 and accepted by the administrative committee on papers and publications for the *Proceedings*, together with discussion. A list of all special technical publications published by the society since incorporation is given on the last two pages of the volume.

Electro INVITES TROUBLE!

We welcome for consultation, chemists and engineers from industrial and ceramic plants faced with special problems. A meeting of minds for development of theories and experimental application of conclusions often achieves something approaching perfection in a very short time.

Grant S. Diamond

GRANT S. DIAMOND, President

Electro SINCE 1919

WHEN we say, "Electro invites trouble", we mean *your* troubles, most especially as they may relate to our principal raw material, Electro-Carb (silicon carbide). While many Electro products are now accepted as standard, they were originally developed to solve production problems for manufacturers who conceived better ways only to find that the enabling tools and equipment had not even been thought of. Now that we are producing our own silicon carbide (Electro-Carb) in our new, wholly owned plant, we are even better equipped than ever before, to co-operate in the solution of special problems for the industries we serve. (See below)

Electro SERVES THESE INDUSTRIES WITH THESE Electro PRODUCTS

METAL—Non-Ferrous and Ferrous Foundries: Steel Mills and Smelters: Brass Rolling Mills: Heat Treaters and Annealers.

CERAMIC—Potteries: Art Potteries: Manufacturers of Grinding Wheels: Sanitary Ware: Floor and Wall Tile: Electrical Porcelain: Miscellaneous Ceramic and Enamel Plants.

AUTOMOTIVE—Foundry, foundry cleaning, abrasive cutting-off, heat treating, tool room and precision grinding and finishing departments.

CHEMICAL—For applications where high temperatures or other severe operating conditions indicate the use of special refractories and cements.

SHIPBUILDING—Weld grinding, abrasive cutting-off, tool room and precision grinding, foundry, foundry cleaning, heat treating, power plant refractories.

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ABRASIVE WHEELS—Resin-bonded, High-Speed Grinding Wheels to cover nearly every conceivable use from snagging and cutting-off operations to fine precision grinding.

CRUCIBLES—(Tercod-Conqueror) Pedestal Blocks and Pot Lids—The Carbon-bonded Crucible for melting aluminum—nickel—copper—the brasses and bronzes—zinc—silver—gold—iron, using any fuel: oil, gas, coke or coal, electricity.

REFRACTORIES—Special Refractories—Electric furnace refractories of all kinds used for:

CERAMIC KILN FURNITURE—Slabs and Posts for rigid, floating or semi-floating open construction; plate setters, tile setters, sanitary ware setters and silicon carbide saggers.

MUFFLES AND HEARTHS—One piece and sectional for enameling furnaces, tunnel kilns, assay and heat treating furnaces, pottery kilns.

CRUCIBLE FURNACE FURNITURE—Linings, covers, insulation, burner blocks.

PYROMETER TUBES—And tubes for other purposes.

BRICK—9" series or special shapes to individual specifications.

BURNER BLOCKS—Electric furnace door blocks, door frames, port blocks and electrode sleeves.

STOPPER HEADS—For steel ladles; also slag hole and tap hole blocks for Cupolas.

CEMENTS—Cements and Ramming Compositions—Of special refractories used by all industries; monolithic linings for electric, gas and oil furnaces; patching furnace walls, laying brick, boiler setting and ladle linings.

ALLOYS—Special compositions for additions, deoxidation, degasification, purification: Copper — Aluminum — Chromium — Titanium — Nickel — Silicon — Magnesium — Iron — Lithium — Calcium — Calcium Boride — Tin — Zinc — Lead.

K-363

Electro Refractories & Alloys Corporation

West Coast Warehouse
344 DELAWARE AVE. LOS ANGELES BUFFALO 2, N. Y.

By EDWIN BREMER

FOUNDRY Developments

WITH all the discussions on magnesium additions to produce spherulitic, spheroidal carbon, ductile, or nodular cast iron, particularly with reference to methods of introducing the magnesium, it seems strange that someone has not suggested a combination of iron and magnesium in granular or powder form bonded together with sodium silicate to form briquets. Additionally, some of the magnesium fluxing agents such as magnesium fluoride, magnesium chloride, sodium fluoride, etc., might be included. Instead of iron powder, one might try powdered ferrosilicon, or perhaps a mixture of the two with just enough ferrosilicon to provide the desired inoculating effect.

* * *

BRITISH foundry has developed manganese cast irons whose properties are similar to cast manganese steel; strength and ductility are a little lower and the wear resistance somewhat higher. For sections up to ¾-in. the composition is 12 to 15 per cent Mn, 3.0 to 3.5 per cent TC, less than 1.3 per cent Si, and less than 0.10 per cent P. For sections over ¾-in. and up to 2 in. the composition comprises 9 to 11 per cent Mn, 2.8 to 3.2 per cent Ni, 2 per cent Si, 3.0 to 3.3 per cent TC, and less than 0.10 per cent P. Castings are given a decarburizing anneal from 5 to 70 hr at 1000 to 1100°C (1832 to 2021°F) and water quenched. Time at temperature depends on section thickness.

* * *

IMPROVEMENT in the quality of alloy and straight chromium grades of stainless steel, plus cost savings with an increase in output per operating hour, result from use of oxygen in the electric furnace production of those materials, according to A. C. Ogan, Duquesne Works, Carnegie-Illinois Steel Corp., in a paper presented at the Electric Furnace Steel Conference. High-silicon scrap is charged to make up the portion of the charge that is not stainless, and some ore or cinder is added. Oxygen blow is started when the bath is about three-fourths melted, and the ore is beneficial in starting oxidation of silicon and manganese during the early stages of melt-down. Reaction of oxygen and silicon in the bath develops sufficient heat to raise the temperature of the bath quickly to above that required to provide a reduction in carbon content in preference to the formation of chrome oxide, even though unmelted scrap remains around the banks. As a result carbon elimination is well under way by the time the bath is melted completely, and the additional time required to reduce the carbon content to 0.04 or 0.05 per cent is decreased greatly.

* * *

ENGINEERS of Westinghouse Electric Corp. and Al-Fin Division, Fairchild Engine & Airplane Corp., developed a lightweight aluminum radiator for cooling transmitting tubes used in radio broadcasting which reduced the weight of a 25,000 watt tube from 225 to 98 lb, and a 10,000 watt tube from 44 to 18 lb. Procedure involves casting on and integrally bonding a thick layer or muff of aluminum to a hollow steel core which in turn is soldered directly to the tube anode. The 140 vertical aluminum radiator fins are brazed to the muff so that they fan out like a tissue-paper Christmas bell.

World's most powerful mobile x-ray generator recently demonstrated at the Naval Ordnance Laboratory, White Oak, Md. Unit is a 10-million volt betatron whose rays will penetrate 16 in. of steel, and shown here is being arranged to radiograph a 17,000 lb stockless anchor. Official U.S. Navy photograph

* * *

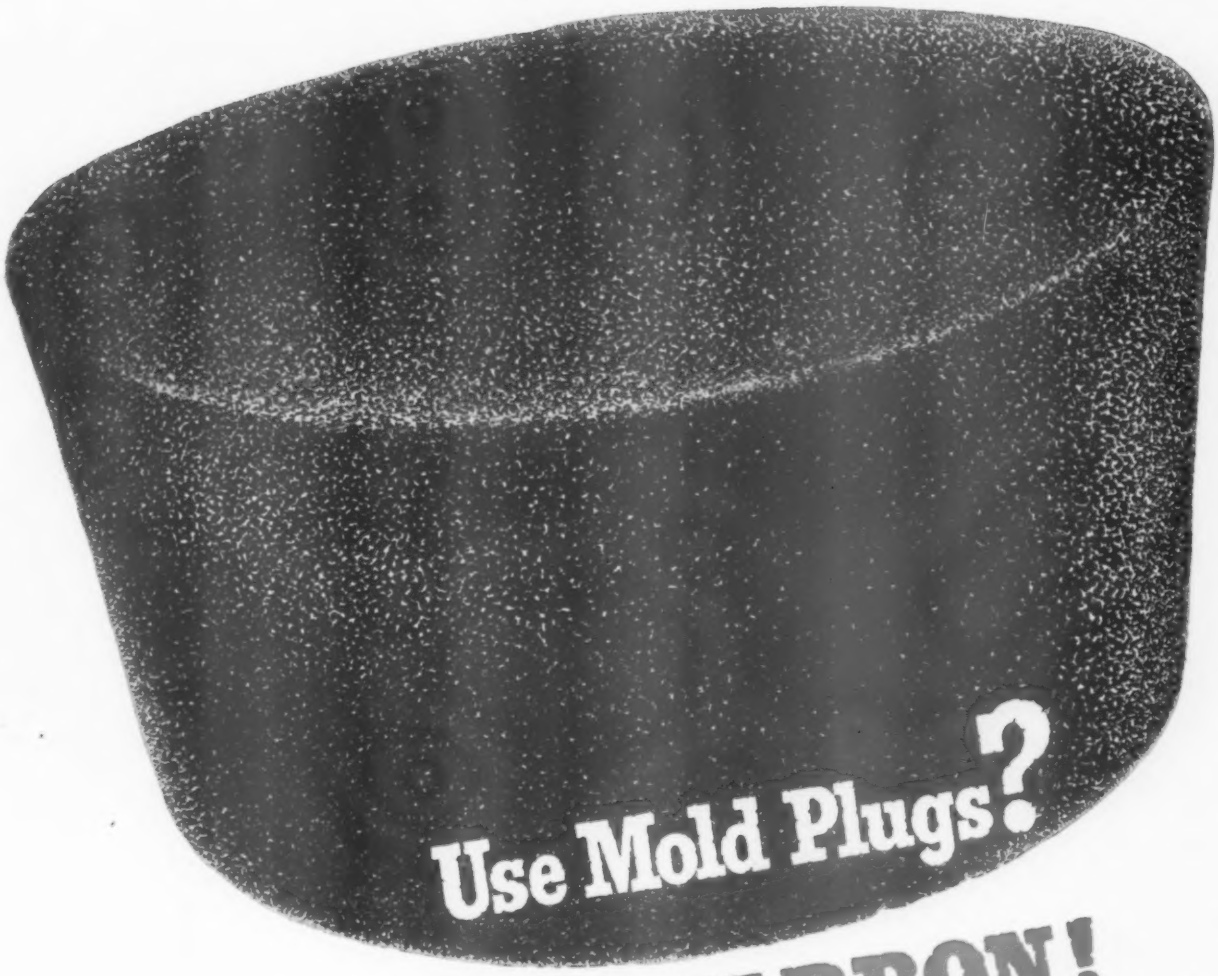
COMPOSITION of insulating material to be used on sprues and risers for nonferrous castings, and which can be molded into any desired shape, is composed of 3¾ lb diatomaceous earth, 12 oz bentonite, and 1 pt resin made up of 160 grams phenol formaldehyde resin, 240 grams alcohol and 2 qt water. Resulting mixture is of the consistency of putty. Previous to use the sleeve or form is baked at 400° F. After it has filled its purpose, it may be ground up and used on top of risers as insulation.

* * *

JOHN F. DRAKE and T. G. Kennard, in discussing the application of a closed-top charging device on a cupola with a dry dust catcher and gas washer at the recent Western Metal Congress, pointed out that: Test runs have shown a surprising regularity in amount of dry dust collected even when the scrap charged has varied in character. The average amount of dry dust collected varies from 11.3 to 14.9 lb per ton of iron charged. Density measurements are not in agreement with the conception that larger particles emitted are primarily iron oxide. Chemical analysis shows a surprising amount of lead and zinc as well as significant amounts of sulphur.

* * *

OFFICE of Technical Services, Department of Commerce, Washington 25, has published a subject index to technological documents issued in Vol. X of the *Bibliography of Scientific and Industrial Reports* which is available for $1. Indexes for Vols. I to V also are available from the Superintendent of Documents, Washington 25 at the following prices: Vol. I 50 cents; Vol. II 35 cents; Vol. III 35 cents; Vol. IV 45 cents, and Vol. V 55 cents. Indexes were not prepared for Vols. VI to IX.



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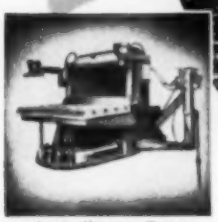
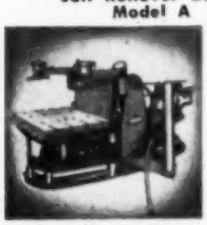
BARE FACTS



Jolt Rollover Draw, Model A



Jolt Rollover Draw, Model SA

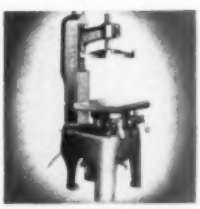
Jolt Pin Lift, Model AJS (portable)

YOU MUST GIVE YOUR MEN MODERN TOOLS

The horse and wagon was O.K. 20 years ago. Hand handling of sand was a back breaker. Ramming a mold with the handle of a shovel is out.

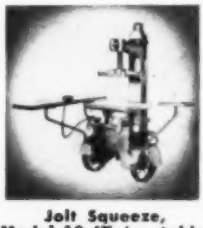
Better face the facts and mechanize your molding department. Davenport molding machines will give you better castings at a lower cost in less time.

Let us send you our catalog. You'll find it worth your time to take a look at the bare facts.



Jolt Squeeze, Model 10-JX (stationary)

Jolt Pin Lift, Model AJS (stationary)



Jolt Squeeze, Model 10-JX (portable)

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PROCEDURE FOR MAKING CASTINGS OF UNIFORM THICKNESS FROM BLOCK PATTERNS

The accompanying illustrations show a reliable method for producing castings of uniform thickness from solid patterns. The method may be applied to open work, such as heating-stove tops, or to solid work, such as the oven doors of cooking ranges.

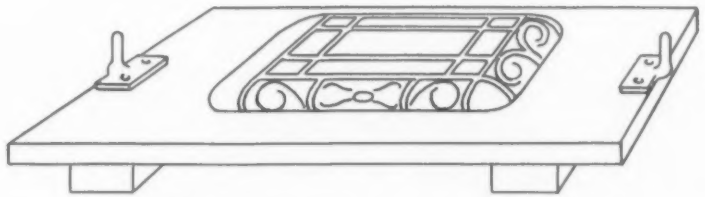
The first step is to make a wood pattern of the shape and form desired. The face of this pattern is the same as that of a loose pattern of like design. At the back, however, the pattern is not hollowed out. This pattern is attached solidly to a board, as shown in the upper view. This board is fitted with pins that fit the drag with which it is to be used.

When molding by this method, the drag is clamped to the board and the sand is rammed hard. This point is important and should not be overlooked. The pattern is drawn in the usual way.

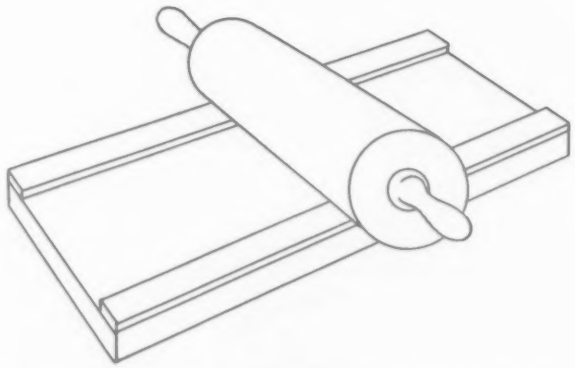
The thickness of the casting section is determined by the thickness of the clay that is used in molding process. The clay is rolled out in sheets with an ordinary rolling pin, on a board having wood strips on its sides. These strips are the same thickness as the section desired in the casting. The board is shown in the lower view. It should be approximately 18 inches long and 6 inches wide while the strips can be of 1-inch material and of the same thickness as the casting section.

The mold is next lined with strips of clay cut from a sheet that is rolled out on the board described. This results in a lining of clay of a uniform thickness in the drag. The cope is rammed in the usual way, gated and vented and set aside. The clay is removed, the drag is shaken out and a new drag is made on the pattern board, as would be done in ordinary practice. The mold then is closed and is ready for pouring.

Potter's clay gives good results in molds of this kind. It should be tempered with water firm enough to handle conveniently and preferably should be dusted with facing before rolling out on the board. It is also advantageous to varnish the rolling pin and the clay board as this prevents the clay from adhering.

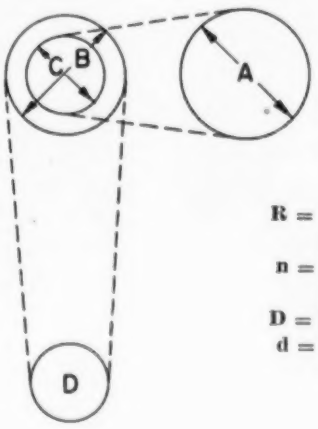


Solid block pattern attached to mounting board



Strips on side of board determine thickness of clay

METHODS OF DETERMINING DIAMETERS AND SPEEDS OF DRIVING AND DRIVEN PULLEYS



Revolutions Per Minute on Driven Pulleys

The number of revolutions per minute of a driven pulley is equal to the product of the revolutions per minute of the driving pulley and the diameter of the driving pulley divided by the diameter of the driven pulley. Or where,

R = Revolutions per minute of the driven pulley.
n = Revolutions per minute of the driving pulley.
D = Diameter of the driven pulley.
d = Diameter of the driving pulley.

$$R = \frac{dn}{D}$$

Diameters of Driven Pulleys

The diameter of a driven pulley is equal to the product of the revolutions per minute of the driving pulley and the diameter of driving pulley divided by the revolutions per minute of driven pulley.

$$D = \frac{dn}{R}$$

Diameters of Driving Pulleys

The diameter of a driving pulley is equal to the product of the diameter of driven pulley and revolutions per minute of driven pulley divided by revolutions per minute of driving pulley.

$$d = \frac{DR}{n}$$

Revolutions Per Minute of Driving Pulley

The number of revolutions per minute of a driving pulley is equal to the product of the diameter of driven pulley and the revolutions per minute of driven pulley divided by the diameter of driving pulley.

$$n = \frac{DR}{d}$$

Revolutions Per Minute of Driven Pulley in Compound Drive

The number of revolutions per minute of the second driven pulley is equal to the product of the revolutions of the first driving pulley and the quotient obtained by dividing the product of diameters of driving pulleys by the product of diameters of driven pulleys. Or where,

A and B = Diameters of the driving pulleys.
C and D = Diameters of the driven pulleys.
N = Revolutions per minute of second driven pulley.
n = Revolutions per minute of first driving pulley.

$$N = \frac{nAB}{CD}$$

Pulley Diameters in Compound Drive

Place the revolutions per minute of the driving pulley as the numerator of a fraction and the revolutions per minute of the driven pulley as the denominator, and reduce this fraction to its lowest terms. Then resolve both numerator and denominator into two factors and multiply each pair of factors (that is one in the denominator and one in the numerator) by a number which will give pulleys of large enough diameter.

Example: The number of revolutions per minute of A = 320 per minute.
The number of revolutions per minute of D = 900 per minute.

$$\text{Fraction} = \frac{320}{900} = \frac{16}{45} \text{ resolve into factors } \frac{8 \times 2}{9 \times 5}$$

$$\text{Multiplying pairs by same numbers} = \frac{(8 \times 1) \times (2 \times 4)}{(9 \times 1) \times (5 \times 4)}$$

$$\text{or } \frac{8 \times 8}{9 \times 20}$$

∴ 8 and 8 are diameters of driven pulleys C and D and 9 and 20 are diameters of driving pulleys.

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SKIL Oscillating Sander provides *fastest*-cutting and *smoothest* surfacing in a single operation. Exclusive compound action drives front edge with a circular motion... and trailing edge back and forth.

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SKIL Belt Sanders lead the field at any finish. Powerful cool-running motors drive belts at right speeds to give smooth, ripple-free surfaces faster. Perfectly balanced, easy to handle, efficient, economical. The ideal sander for polishing brass, bronze and aluminum sheets.

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SKIL Belt Sanders provide highest sanding speed (10 times faster than by hand) yet give flat surfaces a hand-sanded finish. Ideal for preparing surfaces for painting, varnishing or lacquering. Makes quick, easy work of removing old finishes.

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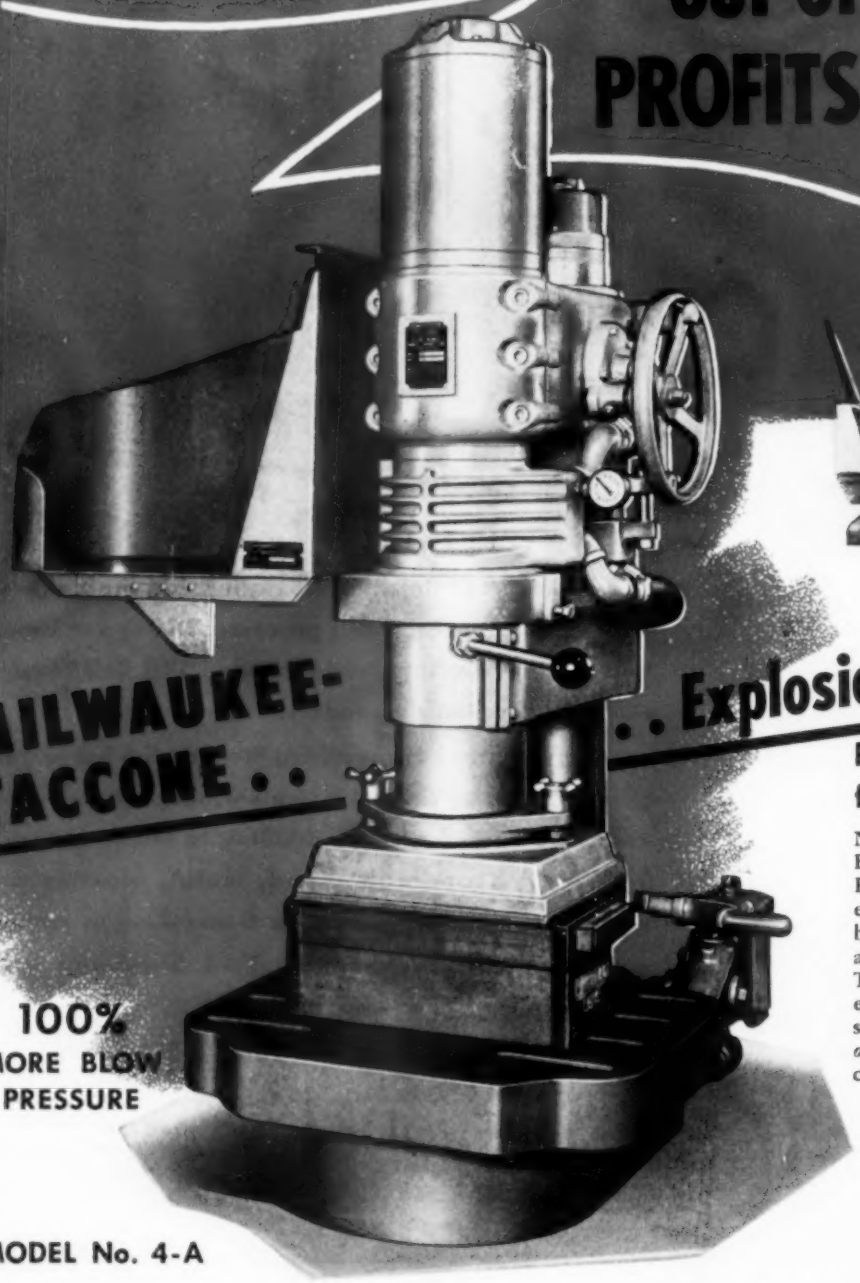

100% MORE BLOW PRESSURE

MODEL No. 4-A

Profit-Making Machines that Work for You While You Pay for Them!

Now—you can buy new Milwaukee-Taccone Core Blowers for your foundry on our easy PAY-FROM-PROFITS plan. No substantial cash outlay required. Merely send us your order, then pay for the blowers while they work for you. The savings alone, in many cases, take care of the payments. This new, convenient PAY-FROM-PROFITS plan enables you to replace old, obsolete equipment, step up foundry production and reduce costs *without adding materially to your investment.* Write for complete details.

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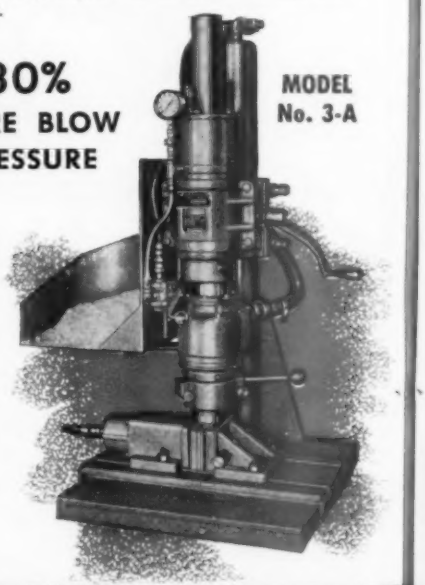

HEAVY DUTY BENCH STYLE CORE BLOWER

Blows green bond cores up to 12 lbs. in size—ideal for high production foundries. Entire blowing cycle only 2½ seconds. Compression cylinder boosts blowing pressure 100% to maintain constant, high pressure. Intricate, quality cores blown quickly with EXPLOSION type action. Accommodates various sized blow heads. Draw cylinder in base, if desired.

FAST, LIGHT CORE BLOWER

This modern, bench style machine blows intricate cores up to 4 lbs. in weight. Synchronized clamping and blowing increase speed and efficiency. Blown cores automatically released, can be removed as fast as blown. Blower steps 90 lb. line pressure up to 120 lbs. blowing pressure.

MILWAUKEE Foundry Equipment Co.

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AFS CONVENTION

(*Continued from page* 73)

part of production of this type of iron. Its shrinkage is greater than gray iron but less than malleable. Its directional solidification characteristics are similar to steel, and gating requires special care. So far there has been no need of any change in normal foundry practices in making of castings. He pointed out that while spheroidal carbon iron might encroach on some ferrous castings, the general tendency would be to replace other methods of fabrication.

Mr. Donoho reported he had found that use of graphite as an inoculant does not cause trouble, as previously indicated where it apparently led to reversion of flake graphite. He also found that the effects of magnesium additions do not wear off too rapidly. With 1000-lb ladle of treated iron poured in 11 to 12 minutes, the first bar showed 99,000 psi and the last 107,000 psi with brinell hardness numbers of 255 and 262, respectively. Fluidity and shrinkage from first to last were satisfactory.

Mr. Vennerholm pointed out that magnesium-treated irons based on the usual automotive composition containing 0.15 to 0.25 per cent P and 0.70 per cent Mn resulted in a nodular iron having only about 1½ per cent elongation rather than the several per cent usually attributed to the material. To obtain the higher percentages, low phosphorus and manganese are obligatory, hence the raw materials would have to be selected—resulting in higher cost. Mr. Vennerholm stated that, in his opinion, nodular cast iron would not replace present cast ferrous materials, but rather would augment them.

Mr. McElwee pointed out that production of spheroidal carbon or nodular irons needed careful control since, to obtain the best and most economical results, the sulphur content has to be known, and the phosphorus and manganese held to low values. Consequently, the foundry must be in a position to produce good iron and castings in the first place, or clean up its practice to do so.

T. E. Wickenden, International Nickel Co., New York, mentioned that several magnesium additives, including pure magnesium and magnesium vapor, would produce spheroidal iron with either hypereutectic or hypoeutectic irons. Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., stated that the lower the sulphur and phosphorus, and the higher the total carbon, the better the resulting material, and with better control and know-how, spheroidal cast iron would find its proper niche.

Charles M. Offenhauer, Union Carbide & Carbon Research Laboratories,

(*Continued on page* 128)

Non-Ferrous Founders' Society Honors Old Timers

ST. LOUIS Chapter of the Non-Ferrous Founders' Society was host to the board of directors of that organization, visiting nonferrous foundrymen and their wives at a dinner meeting held Monday, May 2 at the York Hotel, St. Louis. Dedicated to the "Old Timers" of the industry, the first guest of honor was William Schneider, owner and operator of the Western Bronze & Brass Foundry, Denver, Colo., since 1904, who has been active in the nonferrous foundry industry for 75 years.

Albert J. Messmer, Messmer Brass Co., chairman of the society's St. Louis chapter, announced with a great deal of pride that his father, Joseph Messmer, held second place in point of service among those present with 61 years in the industry.

The meeting was then turned over to the president of the society, Fred Haack Jr., president of the Capital Brass & Aluminum Foundry Co., Chicago, who presented Billy Schneider with an engraved trowel from the Non-Ferrous Founders' Society. In accepting the trowel, Mr. Schneider said he was proud of his industry. This fact was evidenced by his son's 28 years and his grandson's one year of foundry work. Billy cut the first piece of his 75-year anniversary cake with his new trowel and the foundrymen and their wives enjoyed it with him.

President Haack addressed the group briefly and pointed out that while the organization is small in number, its growth and activity has continued steadily. One of its most valued activities is the opportunity it provides for foundrymen to get together to solve their problems for mutual benefit.

The evening was concluded with introduction of the society's past presidents along with the board of directors. All agreed it was one of the most successful meetings any chapter has held and that the tribute to the old-time foundrymen who have supported the industry so loyally was most timely.

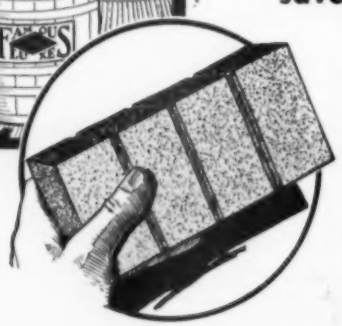
William Schneider (second from left), with 75 years in the foundry industry, outranked others in point of service at the recent dinner of the Non-Ferrous Founders' Society in St. Louis. He is shown with his son Arthur Schneider at left (28 years of service) and grandson Lee Schneider (1 year). At right, Joseph Messmer, second ranking veteran with 61 years, is shown with his son Albert J. Messmer (29 years of service)

STRIKE

CASTING REJECTS DUE TO IMPURITIES IN MOLTEN M

by using

Famous C



THE SCORED BRICK FORM saves time and labor in using.

It enables you to flux a charge of iron in a few seconds—correctly. No digging out of container. No weighing. No measuring. Just toss this flux into cupola with each ton charge of iron or break off one to three briquettes (quarter sections) for smaller charges.

Famous CORNELL CUPOLA FLUX IN SCORED BRICK FORM

CLEANSES MOLTEN IRON. Removes dirt and other foreign matter, including sulphur. Makes it hotter and freer flowing.

THE PAYOFF. You pour castings that are cleaner, tougher, stronger, more even grained, and amazingly free from chilled sides, hollow centers, hard spots, etc. And machining is definitely easier and smoother.

KEEPS CUPOLAS CLEANER. Famous Cornell Flux reduces bridging-over to a great extent. Drops are cleaner. Brick life is prolonged due to the glazed or vitrified film which is formed on the surface over and above the melting zone. Maintenance time and labor is comparatively nil.

Write for Bulletin 46-B containing full details

Mfrs. of IRON, SEMI-STEEL, MALLEABLE, BRASS, BRONZE, ALUMINUM, and LADLE FLUXES -- Since 1918

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MALLEABLE FOUNDRIES *with* CUPOLA OPERATION

are showing a rapid trend towards the use of Famous Cornell Cupola Flux. Reports of greatly improved casting production come from every direction. Furthermore, there is a considerable reduction in cupola maintenance labor and cost. The life of cupola lining, whether brick or stone, is greatly prolonged.

Famous CORNELL BRASS FLUX

CLEANSES MOLTEN BRASS. IMPROVES CASTINGS, even when the dirtiest turnings and sweepings are used.

It conditions your metal so that you pour sounder, stronger, denser grained castings, which is vitally essential in the manufacture of any casting that must stand the pressure test and take an extra fine finish.

This flux contains several elements which combine to gather the gases, while the metal is being melted, and cause them to form into balloon shaped bubbles and rise to the top of metal. The slag is very essential as a cover to retain the heat during melting process.

Less tin and other metals are required. Crucible and furnace linings are preserved.

Famous CORNELL ALUMINUM FLUX

CLEANSES MOLTEN ALUMINUM. IMPROVES CASTINGS. By removing foreign matter, it enables you to produce sounder, tougher castings.

More scrap can be used without danger of porous or spongy spots in castings.

Thinner yet stronger sections can be poured.

It improves working conditions. Exclusive formula greatly reduces obnoxious gases.

The dross does not contain any metal after flux is used.

Write for Bulletin 46-A

D FLUX *Company*
E. W., CLEVELAND 13, OHIO

FAMOUS CORNELL FLUXES
Trade Mark Registered

(*Continued from page* 125)

Niagara Falls, N. Y., mentioned that a zirconium-magnesium-silicon alloy shows promise as a means of introducing magnesium, and provides a longer holding time in the ladle. C. O. Burgess, Gray Iron Founders' Society, mentioned that definite control is a necessity in producing the new material, and urged a pooling of informative data on production method and properties. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, said he doubted that nodular iron would replace gray iron where damping properties were involved, or in sliding friction applications involving wear resistance. He also mentioned the confusion which exists with regard to the patent situation in the field of nodular and spheroidal irons.

MALLEABLE IRON DIVISION

Has Comprehensive Program

ACTIVE participation in discussions and well attended sessions marked the Malleable Iron Division meetings. Holding four technical sessions, a roundtable luncheon discussion and a joint meeting with the Gray Iron Division, a variety of subjects were considered. These ranged from the theoretical to the practical side. Indubitably of greatest interest was the joint meeting where spheroidal carbon or nodular cast iron was discussed by a panel of experts.

First malleable iron session was held Monday morning with J. A. Durr, Albion Malleable Iron Co., Albion, Mich., and H. L. Day, Auto Specialties Mfg. Co., St. Joseph, Mich., presiding. J. E. Rehder, Bureau of Mines, Ottawa, Canada, presented a discussion on "Effects of Temperature and Silicon Content on First Stage Annealing of Blackheart Malleable Iron" in which he pointed out that in the case of temperature and time necessary for first stage annealing, the relationship falls on straight parallel lines when plotted as the logarithm of time against temperature; the average slope for Fahrenheit degrees being -0.0042.

In practice this can be used by experimentally determining one point for the actual iron and equipment being used and drawing a line through the point parallel to the average slope on semi-logarithmic paper. Similarly, plotting the logarithm of silicon content against the logarithm of first stage annealing time produces a straight line whose slope is dependent upon the carbon content; the slopes vary from 2.69 for a 2.0 per cent C iron to 1.71 for a 2.8 per cent C iron.

In a second paper on "Surface Hardening of Pearlitic Malleable Iron" by S. H. Bush, W. P. Wood and F. B. Rote, University of Michigan, Ann Arbor, Mich., which was presented by Mr. Bush, information was given on use of induction and flame heating. In induction heating using a 3000-cycle unit, results gave too deep a case, while with a 9000-cycle unit satisfactory results were obtained using 32 to 75 kw power input. The determining factor is a Rockwell-C hardness of 50 with a depth of 0.060-in. In flame heating the most satisfactory results were obtained with a temperature of 1500° F with a water-spray quench.

In the discussion it was brought out that chemical composition apparently has no effect in induction heating, but the correct time of heating and power input are important. In flame heating an increase in manganese content results in increased depth of the hardened case. Also, water quenching is preferable to oil. It was reported that further work on hardening is being conducted, and the results will be reported.

Second malleable session was under the direction of W. D. McMillan, International Harvester Co., Chicago, and R. P. Schauss, Illinois Clay Products Co., Chicago. Opening paper on "Influence of Type of Slag on Heat Treatment Susceptibility of Malleable Iron," by G. A. Vennerholm and H. N. Bogart, Ford Motor Co., Dearborn, Mich., was presented by Mr. Bogart. It described how difficulties in annealing malleable iron cold melted in an electric furnace were eliminated by regulation of the slag color.

With black slags 100 per cent of the castings required recycling in heat treatment while with dark green slags only 25 per cent had to be recycled. When slags were light green 100 per cent of the castings were good. Investigation of slag composition showed that the preferable light green color was obtained when the iron oxide content was not over 18 per cent. In practice, the procedure is to remove the dark slag after meltdown, and build a new slag of the desired color.

In the discussion J. E. Rehder, Canadian Bureau of Mines, Ottawa, stated that the data presented indicated that slag control so common in steel melting may become important in malleable production. He inquired whether the slags used caused any refractory trouble, and in the adjustment of dark, high-oxide slags to the light green low-oxide slags, what happened to the iron oxide. The reply was that the addition of lime to make the adjustment did not cause any higher refractory wear, and that it also caused dilution of the slag which would show a lower oxide content, although some was reduced to iron.

James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, pointed out that lime slags are less destructive than iron silicate slags on refractories. Carl F. Joseph, Central Foundry Division, General Motors Corp., Saginaw, Mich., said he had found that, in cupola-electric furnace duplexing, use of slow-burning coke permitting use of more coke, gives a light-colored slag, and makes an iron easier to anneal. However, so far he has not been able to control cupola melting by the color of the slag. W. E. Farrell, Auto Specialties Mfg. Co., St. Joseph, Mich., stated that holding the iron in the electric furnace for appreciable periods is detrimental to annealability, and that he agreed with the speakers on using low iron oxide bearing slags.

Heat Sections of Step Bars

Second paper, on "Influence of Heating Rate on First Stage Graphitization of White Cast Iron", by Richard Schneidewind, University of Michigan, Ann Arbor, Mich., and D. J. Reese, International Nickel Co., New York, was presented by Mr. Schneidewind. It described data obtained by heating sections of step bars cast from the same ladle of iron, the steps being ⅛, ¼, ½, ¾, and 1½ in. thick. The sections were heated at different rates, namely 135°, 350°, and 6500° F per hour between 1200 and 1700° F. It was found that the time necessary to complete first stage annealing decreased as the heating rate was decreased. This can be expressed as $\log \theta_R/\theta_f = -30/R$ where θ_R is the hours at 1700° F for first stage annealing after bringing to heat at R°F per hour, and θ_f is the hours at 1700° F for first stage annealing after bringing to heat infinitely fast, such as when a small sample is placed in a laboratory furnace already at 1700° F. Preheating at 800° F showed some increase in annealing velocity although a proportional increase in time for heating to the soaking temperature seems

(*Continued on page* 130)

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(*Continued from page* 128)

better.

Third malleable iron session featured two papers—"Some Effects of Deoxidation Treatments on Graphitization of White Cast Iron," by R. W. Heine, University of Wisconsin, Madison, Wis., and "Influence of Silicon Content on Critical Temperature Range During Slow Cooling of Blackheart Malleable Iron," by J. E. Rehder, Canadian Bureau of Mines, Ottawa. Carl F. Joseph, Central Foundry Division, Saginaw, Mich., was chairman and C. F. Lauenstein, Link-Belt Co., Indianapolis, co-chairman.

In his paper, Mr. Heine described the study of some effects produced when deoxidizers — aluminum, titanium, and hydrogen—are added to white cast irons. Results indicate that white cast irons treated with deoxidizing additions to the melt develop eutectic or film-type sulphide inclusions during solidification. A number of investigators have related such inclusions to an absence of oxygen in the melt and a minimum residual of the deoxidizing element.

The oxygen content was discovered to be higher than previously reported by the effect on inclusions, chemical analysis for residuals and graphitization phenomena. Small deoxidizing additions of aluminum to the white iron decreased the number of graphite nodules and shortened the time required for first stage graphitization. Larger additions of all types of deoxidizers produced a fine graphite dispersion rather than the normal nodular graphite and reduced first stage graphitization time to a minimum.

However, the addition of titanium beyond that amount required for deoxidation caused a return to nodular type graphite and an increase in first stage graphitization time. Subcritical graphitization of the irons is related to complete deoxidation. Through the deoxidation effects studied, oxygen was shown to be an important element in determining the response of a white iron to graphitizing heat treatments.

Deoxidation practice is indicated as a possible method of controlling the number of graphite nodules and the time required to attain complete first stage graphitization.

In a written discussion, R. P. Schauss, Illinois Clay Products Co., Chicago, stated that his experience with 0.01, 0.015 and 0.02 per cent aluminum additions showed that the two greater additions produced a 20 per cent improvement in ductility, with no reduction in strength characteristics. Additional work done on the rate of anneal showed that aluminum additions produce a marked improvement in annealing time. He stated, however, that the use of aluminum tends to promote formation of primary graphite in heavier sections, and it should be used only under conditions of close control.

Open discussion brought out the facts that Mr. Heine found no reduction in the sulphur content of white irons, resulting from additions he studied. He also stated that residual aluminum in the iron was aluminum and not aluminum oxide.

Silicon Content Important

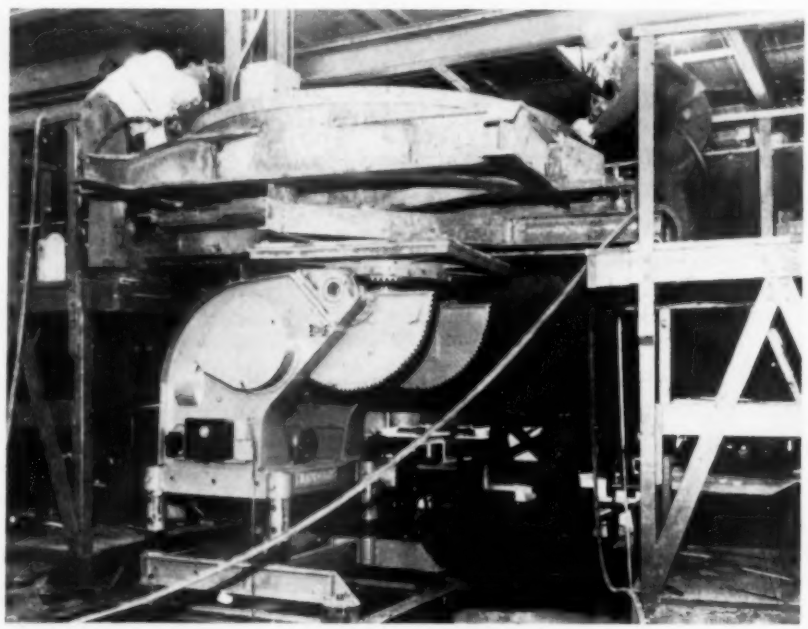
In his paper Mr. Rehder discussed the "Influence of Silicon Content on Critical Temperature Range During Slow Cooling of Black Heart Malleable Iron." Tests were made on a series of white cast iron bars made up of a pig iron and steel charge, whose carbon content was approximately 2.55 per cent, with silicon varying from 0.76 to 1.57 per cent. Results indicated that a critical temperature range exists for iron-carbon-silicon alloys in the range of chemical compositions used in commercial malleable iron operations. Upper and lower limits of that range within which austenite, ferrite and graphite co-exist in apparent equilibrium, rise and widen as silicon content increases.

Mr. Rehder stated that in the range of 0.75 to 1.60 per cent silicon and cooling rates of 7 to 30° F per hour, pearlite appears between 1360 and 1350° F, if it appears at all. The solid solution existing within the critical temperature range, and appearing as troostite or martensite upon quenching, is believed to be austenite. Additional evidence suggests that microsegregation of silicon in a dendritic pattern exists in malleable iron.

Mr. Rehder also stated that cooling rates as high as 600° F per hour between first stage annealing temperature and the upper limit of the critical temperature range do not affect the extent or progress of the reaction within the critical temperature range.

Fourth session on malleable iron had Milton Tilley, National Malleable & Steel Castings Co., Cleveland, and E. Welander, Union Malleable Iron Works, Deere & Co., Moline, Ill., as chairmen. In reporting a survey on "Controlled Atmosphere Annealing of Malleable Iron," R. P. Schauss, Illinois Clay Products Co., Chicago, and chairman of the subcommittee of the Malleable Division, AFS, stated that in number of foundries, relatively few are in position to

(*Continued on page* 132)



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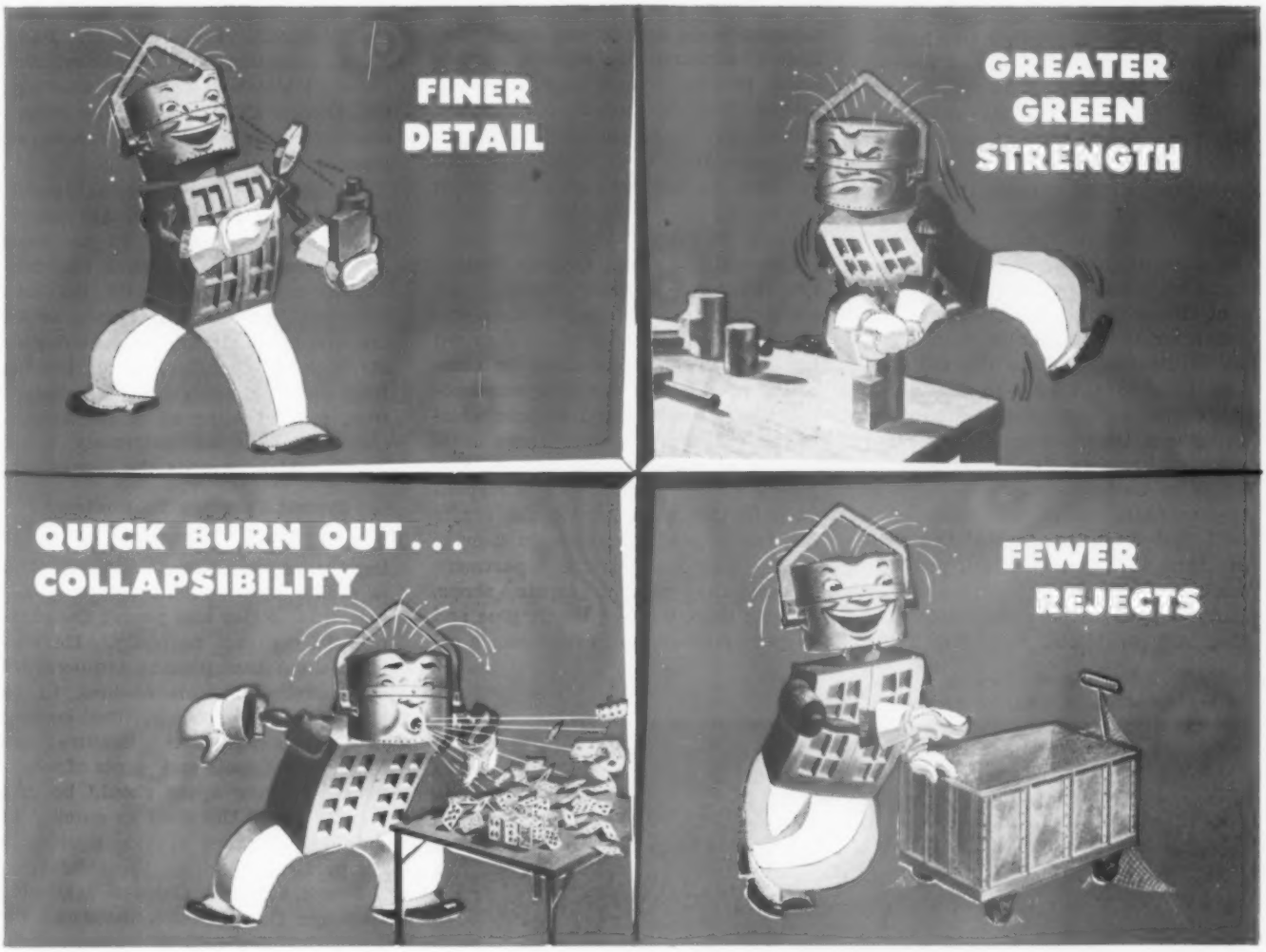

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do much about control, but in terms of tonnage of malleable, atmosphere control is practiced to a marked extent. Most commercial applications of controlled atmosphere use a gas containing carbon monoxide and carbon dioxide, and the ratios vary considerably. Presence of hydrogen or any gas that will produce free hydrogen will decrease the rate of anneal.

In the discussion Duncan Forbes, Gunite Foundries Corp., Rockford, Ill., pointed out that in sealed furnaces such as the bell type, the atmosphere is high in carbon monoxide and low in carbon dioxide. Carl Joseph, Central Foundry Division, Saginaw, Mich., stated that bell type furnaces show as high as 70 per cent CO during first stage annealing, but after the furnace is shut down, air infiltration reduces the CO content to give a 4.5-5.0 to 1 CO/CO_2 ratio for second stage annealing. In radiant tube, continuous type annealing furnaces the carbon monoxide to carbon dioxide content at the entrance is in the ratio of 3 to 1, but drops off toward the cooling zone to 1½ to 1 which prevents scaling.

J. A. Durr, Albion Malleable Iron Co., Albion, Mich., and Mr. Tilley stated that with such furnaces, the gas is bled off to provide around a 2 to 1 CO/CO_2 ratio for second stage annealing. J. E. Rehder, Canadian Bureau of Mines, Ottawa, said he believed that pearlitic rims are caused by oxidation of silicon to inactive silica which slows down annealing. W. R. Bean stated that in an investigation years ago, it was found possible to carburize the surface of malleable in atmospheres high in carbon monoxide which might leave some cementite. G. L. Galmish, Michigan Malleable Iron Co., Detroit, pointed out that he has used an atmosphere containing 40 per cent hydrogen without any difficulty in annealing.

Charles T. Luther, Central Foundry Division, Saginaw, Mich., described the maintenance system employed in his plant—a mechanized foundry. The organization is comprised of a maintenance superintendent and assistant, and a chief electrician. On each shift there is a general foreman who has one or more foremen under him who are responsible for the workmen in the crafts and the care of equipment in definite areas. The maintenance department houses the general repair shops, electric shop, welding booth, pipe and carpenter shops, and maintenance office. Scheduled maintenance, such as oiling and lubrication and inspection, is carried on by the shift gangs, while breakdowns are handled by the maintenance department.

At a malleable roundtable luncheon Tuesday noon, with J. H. Lansing, Malleable Founders' Society, Cleveland, and A. M. Fulton, Northern Malleable Iron Co., St. Paul, Minn., presiding, B. E. Yearley, National Malleable & Steel Castings Co., Cicero, Ill., discussed the reduction of losses caused by cracks or tears.

He said that white iron at 1100°F has no elongation while at 1600°F the elongation is about 15 per cent. At the same temperatures the tensile strengths are 60,000 psi and 8000 psi, respectively. Hence, while the iron could stretch to some degree at high temperature, the trouble from tearing or cracking resulted from concentrating all of the normal contraction in an extremely short length which exceeds the elongation.

Permit Castings To Contract

As examples he mentioned reducing the ramming or packing of sand in molds and cores so that they are somewhat softer and permit the castings to contract normally. He also pointed out that pouring temperature controls the amount of heat to be dissipated, and hence, the cooling rate. Too high a temperature may result in hot spots and points of weakness. Pouring speed should be fast enough to fill the mold as quickly as possible, and thus provide a uniform temperature gradient throughout.

Frank Czapski, Chicago Malleable Castings Co., Chicago, discussed refractories, and said that good refractories required good masonry to obtain satisfactory results, and that at present about 6.72 brick (9-in. equivalent) per ton of metal in duplexing is average consumption. First quality firebrick in the sidewall and bottom of the air furnace were found to give satisfactory service by one large producer.

M. J. Henley, Texas Foundries Inc., Lufkin, Tex., speaking on the same subject, stated that in a cupola using skip charging, four or five rows of silica brick above the tuyeres cut down trouble from hot spots due to channeling. The brick are replaced after every heat. However, by construction of a deflector which places the charge in the center of the cupola, use of silica brick was eliminated, and the refractory life above the tuyeres was increased 50 per cent. With reference to the air furnace, he said that good mortar is

(*Continued on page* 134)

NATIONAL FOUNDRY ASSOCIATION held regional meetings at Detroit on Mar. 15 and at Milwaukee on Mar. 16. E. C. Hoenicke, Eaton Mfg. Co., and NFA fourth district chairman, presided at the Detroit meeting (upper view.) Lewis G. Seaton, General Motors Corp., and George A. Kastner, Lincoln Brass Works Inc., were the speakers. Harry E. Ladwig, Allis-Chalmers Mfg. Co., and NFA vice president presided at the Milwaukee meeting (lower view.) L. E. Roark, NFA executive vice president, and I. R. Wagner, immediate past president of the association, spoke at both meetings

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(*Continued from page* 132)
important in securing good bottom life, and it is preferable to start the laying of the brick in the center, and work to the sides and the ends. Walter Jaeschke, Whiting Corp., Harvey, Ill., said that there has been a decided improvement in present day refractories as compared to those of years ago. Then the pouring temperatures were around 2690°F as compared with 2900°F now.

BRASS AND BRONZE SESSIONS

Cover Melting Problems

FOUR sessions and a roundtable luncheon comprised the program of the Brass and Bronze Division during the first two days of the convention. All were exceedingly well attended and provided lively discussion. At the initial session at which E. W. Horlebein, Gibson & Kirk Co., Baltimore, presided, three papers were presented, the first being "Casting Surface Finish," by H. H. Fairfield and J. MacConachie, chief metallurgist and sand supervisor, respectively, William Kennedy & Sons, Owen Sound, Ontario, Can.

In this paper, delivered by Mr. Fairfield, the authors reported preliminary progress made in developing an experimental procedure for evaluating casting surface finish. Surface finish was measured by weighing a test casting, buffing it to a smooth finish and reweighing the casting, the loss in weight being used as an index of casting finish. Experiments were limited to the casting of 85-5-5-5 bronze into No. 1 Albany natural molding sand. The investigation demonstrated the effects of mold hardness, moisture content, metal temperature and method of filling the flask.

General conclusions arrived at by the authors were: (1) As metal temperature increases, castings poured therefrom have a rougher surface finish; (2) moisture content of molding sand has a considerable effect on casting surface finish. High moisture content will cause surface roughness; (3) the method of putting sand in the flask has a marked effect on casting surface finish. If sand is riddled into the flask, little ramming effort is required to get a smooth surface finish on the casting. With lumpy sand a great amount of work is required to get the mold hard enough to obtain a smooth surface finish on the casting; (4) these conclusions refer to vertical surfaces on castings made in molds prepared on a jolt molding machine.

Answering a question as to whether surface finish varied from top to bottom of a casting, Mr. Fairfield replied that it did. This would be most noticeable in the larger castings at lower temperatures. Pouring temperatures used in the investigation ranged from 2150 down to 1925° F.

Second paper at this session was "Effects of Melting Atmosphere, Time at Temperature and Degasification on Properties of Valve Bronze," by W. H. Baer and B. M. Loring, U.S. Naval Research Laboratory, Washington. Mr. Baer stated that the effects of the factors mentioned in the title on mechanical properties were studied with 100-pound melts made in a lift-coil induction furnace. The melts were made (1) in air, (2) under dry charcoal, and (3) under damp charcoal.

According to the authors, the first type of atmosphere produced favorable mechanical properties, the second much less favorable, and the third extremely poor properties. Holding time had relatively little effect. Degasification with dried nitrogen improved properties only when the melt had been made under the damp charcoal. Metal for the investigation was of nominal composition, 88 copper, 6 tin, 4.5 zinc and 1.5 per cent lead.

Specific conclusions reached by the authors were: (1) Melting valve bronze directly exposed to the air in an induction furnace was found to give normal density and tensile properties; (2) melting this alloy under a dry charcoal cover lowered density and tensile properties. Melting under wet charcoal produced still greater unsoundness and reduction in properties; (3) treatment of the melt with dry nitrogen significantly improved the density and tensile properties of metal that had been melted under wet charcoal; (4) valve bronze melted with no cover and held as long as 15 minutes at a high temperature showed no appreciable effect on the mechanical properties.

"Metal Melting and Its Relation to Gases in Metal" was the title of the concluding paper, presented by O. Edwin Decker, foundry superintendent, Acheson Mfg. Co., Pittsburgh. The author enumerated practical suggestions for melting brasses and bronzes to produce sound castings. The speaker discussed furnace design, size of crucible in relation to furnace, proper control and furnace maintenance.

Among the suggestions Mr. Decker made were: (1) Do not use more than two sizes of crucibles in one size furnace. Preferably build the furnace for one size crucible; (2) if excessive melting time is required, check all phases of the combustion and, if necessary, call in the gas company engineers; (3) melt the metal quickly, remove crucible at once, and pour immediately; (4) be constantly on the alert. If something looks wrong, investigate at once; (5) keep crucibles clean. Dirty crucibles insulate the heat and prevent proper radiation. This is particularly true in aluminum melting practice where thick layers of oxide will accumulate unless the crucibles are regularly cleaned.

Phosphor-copper In Paper Bags

Mr. Decker has found that one teaspoon of 15 per cent phosphor-copper shot will flux 150 pounds of red brass successfully. He places this teaspoonful in a small paper bag and gives furnacemen enough bags for their daily heats. It has been found that when furnacemen are allowed free use of this flux, they not only use too much but also use it during the melting period. The author believes too much phosphor-copper will harm the metal and cause leaky castings.

Mr. Decker was questioned concerning his statement that if a pot of metal is pulled too hot, it should not be cooled by standing, lest it absorb gases—rather, it should be chilled by plunging a gate into the metal. The latter practice, he said, results in a finer grain structure. The chilling is necessary, he pointed out, so that pouring will be at the correct metal temperature. Another speaker commented that if metal is allowed to stand say 15 minutes before pouring, gases will tend to dissipate themselves. It was stated that putting coolers in the metal may introduce gases and cause trouble. Mr. Decker commented that metal should be melted rapidly; in his experience, many foundries melt too slowly.

At the second session, under chairmanship of H. J. Roast, consultant, Canadian Bronze Co. Ltd., Montreal, one paper was presented by D. C. Caudron, Pacific Brass Foundry, San Francisco, and a second by Martin G. Dietl, Crane Co., Chicago.

In the first paper, "Gas-Fired Melting of Copper Base Alloys in a Reducing Atmosphere," the author described a method developed for melting many copper-base alloys under a reducing atmosphere using natural

(*Continued on page* 136)

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(*Continued from page* 134)

gas and subsequently blowing compressed air through the melt before pouring. Prior to 1937, Mr. Caudron had used 14 gravity fuel oil in all his melting. He then changed to natural gas which was essentially methane with 1 part carbon to 4 parts hydrogen. This method was fairly satisfactory for about 6 months, when attention was directed to an article published in THE FOUNDRY, which reported presence of a high-carbon monoxide atmosphere in electric furnace melting and its solution by addition of air. After several attempts to overcome increase in hydrogen content, a 20-gallon receiver was placed ahead of the take-off for blowing. Inlet side has the pipe extending two-thirds of the distance to the bottom, allowing the condensate entering the receiver to fall to the bottom where it can be drained off, the outlet being from the top.

This method, which has been used continuously since 1942, is ascribed the following advantages: It is not necessary to control accurately and periodically check the combustion mixture, either in crucible or open-flame furnaces. In the latter it eliminates slag build-up in the furnace, saving considerable hard labor and maintaining its full capacity. Contamination is eliminated when heats of mutually incompatible alloys follow each other. It reduces melting loss, there being no oxidation, and no metal remains in the furnace. Blowing takes only a short time, whereas a ½ of 1 per cent excess oxygen flame is in contact with the metal during its entire melting period. It is easily accomplished. The melter performs the operation. An overdose is not detrimental. And finally, it establishes a definite end point or condition of the metal. This is of prime importance because it is the purpose of all melting procedures to arrive at a definite result, with assurance of being able to duplicate it consistently.

Discussion following the talk brought out that solid copper castings may be produced by this method by melting the copper similar to the bronze, blowing with air, adding phosphorus and casting. Warning was given, however, that oxidation and reducing conditions must be understood to use this method.

W. Romanoff, H. Kramer & Co., Chicago, acted as co-chairman of the meeting and introduced Mr. Dietl, whose paper, "Problem of Gases in the Indirect Arc Furnace," considered the problem of gassed metal melted in an indirect-arc furnace, and method of correction of such metal. Mr. Dietl stated that causes of low quality metal may be due to methods of melting as well as to foreign matter introduced with the charge. Failure to stabilize or remove the binder used in the furnace lining, and change of atmosphere inside the furnace, also contribute to lowered quality.

The speaker concluded that gassed metal is not a defect nor an operating characteristic of the indirect-arc rocking furnace. A gassed metal condition may be brought about by an "outside" influence. Carbon monoxide atmosphere inside a furnace which is efficiently operated with a clear arc will not be harmful to brasses and bronzes. A dirty, smoky arc liberating nascent carbon may produce gassed metal. Superheating or reheating the metal bath will produce no deleterious gas condition. Reducing atmosphere inside the furnace does not reduce foundry sand on the gates to free silicon. Through relatively close tolerances in the refractory of the furnace, oxidation loss of the brass or bronze is held to a maximum of 0.5 per cent.

Hydrogen Content Reduced

Copper-tin alloys may be melted with an oxidizing flux in the furnace to reduce gassed metal because the hydrogen content is greatly reduced in the presence of a high oxygen concentration. The practice of blowing a stream of air into the furnace is not widely followed as no apparent benefit seems to be gained. Brasses containing considerable zinc and phosphorus may be swept with an inert gas such as nitrogen to lower the hydrogen concentration of the melt and thus reduce possibility of producing gassed metal.

A paper entitled "Graphite Resistor Furnace Melting Practice," by B. N. Ames and N. A. Kahn, senior and principal metallurgist, respectively, Material Laboratory, New York Naval Shipyard, Brooklyn, N. Y., led off the third session. H. M. St. John, Crane Co., Chicago, presided, and B. M. Loring, Naval Research Laboratory, Washington, was co-chairman.

During the war, repair ships operating with the fleet, far from shore establishments, were called upon to furnish emergency replacement castings in all types of alloys, thereby requiring a versatile type of melting unit. The single-phase indirect-arc electric furnace had been practically standard equipment for repair ship foundries at that time. However, characteristics of this unit resulted in an unbalanced power load.

This fact and the difficulties reported by relatively inexperienced shipboard personnel in melting emergency steel heats prompted the Bureau of Ships to sponsor development of the 3/2-phase Scott connected graphite-resistor furnace. First of these units was delivered to the New York shipyard late in 1944 for installation and test, prior to installation aboard repair ships. In their

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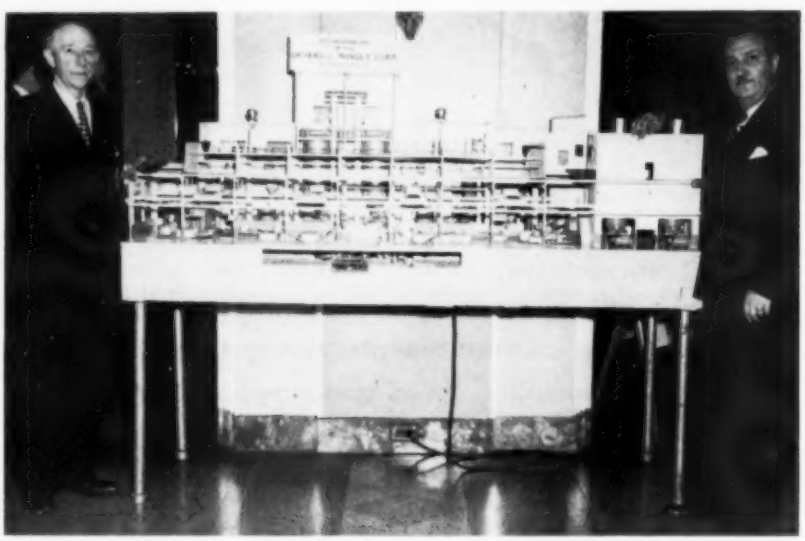
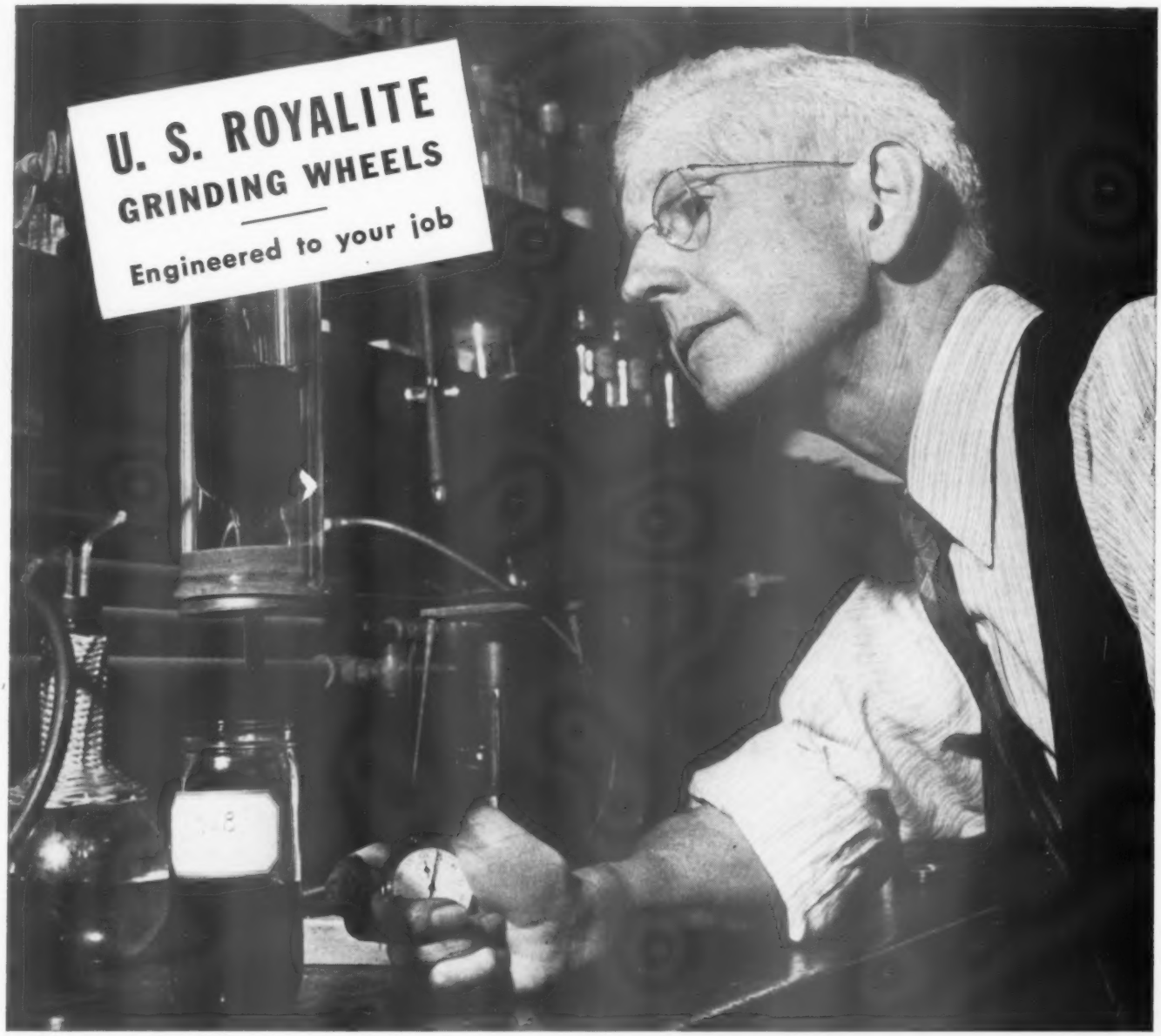


FOUNDRY MODEL: This highly detailed model of a molding unit at the Milwaukee plant of the Universal Rundle Corp. was built by Julius Mueller, foundry superintendent, and Harold Anderson, pattern department superintendent. Scaled ⅜-in. to 1 ft., the unit took five months to build. It is shown here with Messrs. Mueller and Anderson at the last Wisconsin Regional Foundry Conference. (Photo Courtesy W. V. Napp, Badger Firebrick & Supply Co., Milwaukee)



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(*Continued from page* 136)

paper, the authors outlined the basic elements of the design and operating characteristics of this melting furnace and presented data on utilization of zircon refractories with the unit.

Melting by the graphite resistance method has many desirable features, in the opinion of Messrs. Ames and Kahn. Chief among them is its versatility in melting varied types of alloys such as the tin bronze, manganese bronze, monel, cast iron and steel. Its operation is simple and can be handled readily by inexperienced personnel with minimum training. The atmosphere generated by the unit is determined chiefly by the combustion of the resistor elements and not under the direct control of the melter.

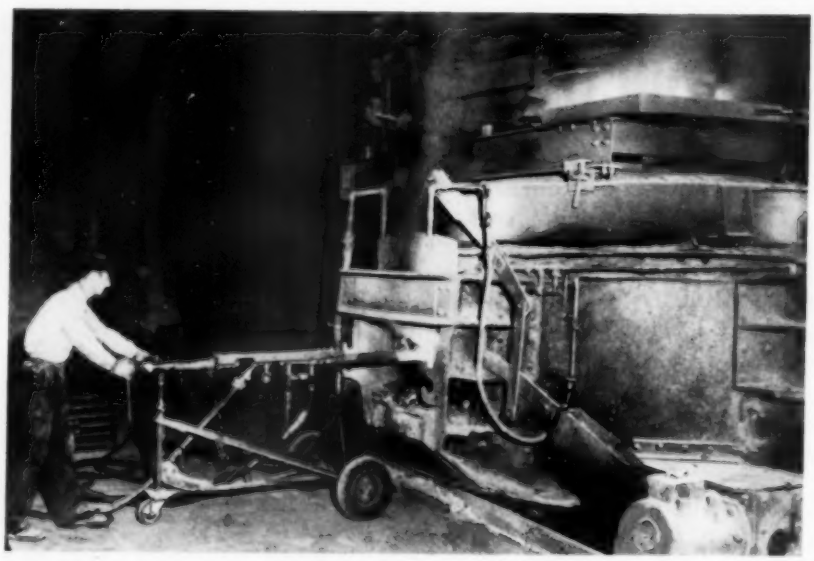
On a continuously operating basis and from an overall cost point of view, it can compare favorably with other types of melting equipment, Mr. Ames stated. In addition, the unit can be utilized as a holding furnace, in duplexing or in superheating, since almost any level of power input can be steadily maintained.

Answering a question concerning resistor consumption, Mr. Ames said that one resistor will give a two-day run on a continuous basis. The life depends on the amount of oxidation which is considerable if operation is intermittent.

At this session, J. P. Ewing, C. Upthegrove and F. B. Rote, University of Michigan, Ann Arbor, Mich., contributed a progress report on the Brass and Bronze Division research project, namely, "Melt Quality and Fracture Characteristics of 85-5-5-5 Red Brass." This was presented by Mr. Ewing, research fellow, and by way of introduction Co-chairman Loring commented on the importance of the project. The investigators reported that they employed clay-graphite crucibles and induction heating. The metal was superheated to 2300° F, cooled and poured in green sand molds. Five types of test bars, all 6 in. long but of different cross sections, were poured in each mold.

Mr. Ewing reported that the density of the fractured test bars correlated well with melt quality, regardless of melting method. In discussion, Martin G. Dietl said the speaker had brought out well the fact that high density does not always mean high quality of the melt, but low density usually indicates low quality melt. H. J. Roast inquired if the fractures are capable of easy interpretation in the shop. Mr. Ewing answered that it is comparatively simple to distinguish low quality from high quality melt. However, intermediate melt qualities are a little more difficult to distinguish.

At this point, the discussion turned to the subject of test bars, and Prof. Howard F. Taylor, Massachusetts Institute of Technology, indicated it is a difficult matter to cast test bars which have uniform fracture cross-section. He suggested it may become necessary to devise a different type of bar to provide controlled solidification. A. J. Smith, Michigan State College, Lansing, Mich., mentioned that a current investigation on standardization of test bars may eventually provide useful information on the subject. Meanwhile the committee welcomes information and suggestions to further its work.



OXYGEN INJECTION: Showing method of introducing oxygen to electric steel melting furnace at plant of Crucible Steel Co. Photo courtesy Linde Air Products Co.

Two papers were presented at the fourth and final brass and bronze session, which was presided over by A. K. Higgins, Allis-Chalmers Mfg. Co., Milwaukee. Prof. H. F. Taylor, served as co-chairman.

"Effect of Composition on Properties and Structure of Cast Monel" was the subject of one paper prepared by J. T. Eash and T. E. Kihlgren, research metallurgist, International Nickel Co. Inc., Bayonne, N. J., and delivered by the former. Nickel-copper alloys are used widely in applications requiring resistance to corrosion and the group containing about 30 per cent copper, and known as Monel, are particularly adaptable to diverse fields due to their properties and availability in both wrought and cast shapes.

Effect of Composition Changes

The paper discussed effect of changes in the base composition, melting practice and certain impurities on the mechanical properties and microstructure of cast Monel. Silicon content in Monel is of major importance due to its solution and precipitation hardening effects. Tensile strengths range from 70,000 to 140,000 psi between 1.5 and 4 per cent silicon. An increase in the ratio of copper to nickel increases the hardness at a given silicon level. The carbon content, the authors stated, should not exceed the solubility limit, for the excess occurs as a graphite which decreases the strength and toughness. Sulphur will form intergranular films and low properties unless fixed by sufficient magnesium. Lead is detrimental to strength at normal and elevated temperatures.

Other conclusions set forth by the authors were as follows:

1. Commercial castings normally contain 30 to 32 per cent copper. A decrease in copper content results in decreased hardening at a given silicon level due to increase in the solid solubility of silicon making less available for age hardening.

2. In 1.5 per cent silicon Monel castings, carbon should be held between 0.15 to 0.20 per cent and at 4 per cent silicon a maximum of 0.15 per cent carbon is desired with lower levels preferable.

3. Oxidation treatment has been found preferable to melting under "over reduced" conditions. Deoxidation with 0.1 per cent magnesium and 0.05 per cent titanium has given good results.

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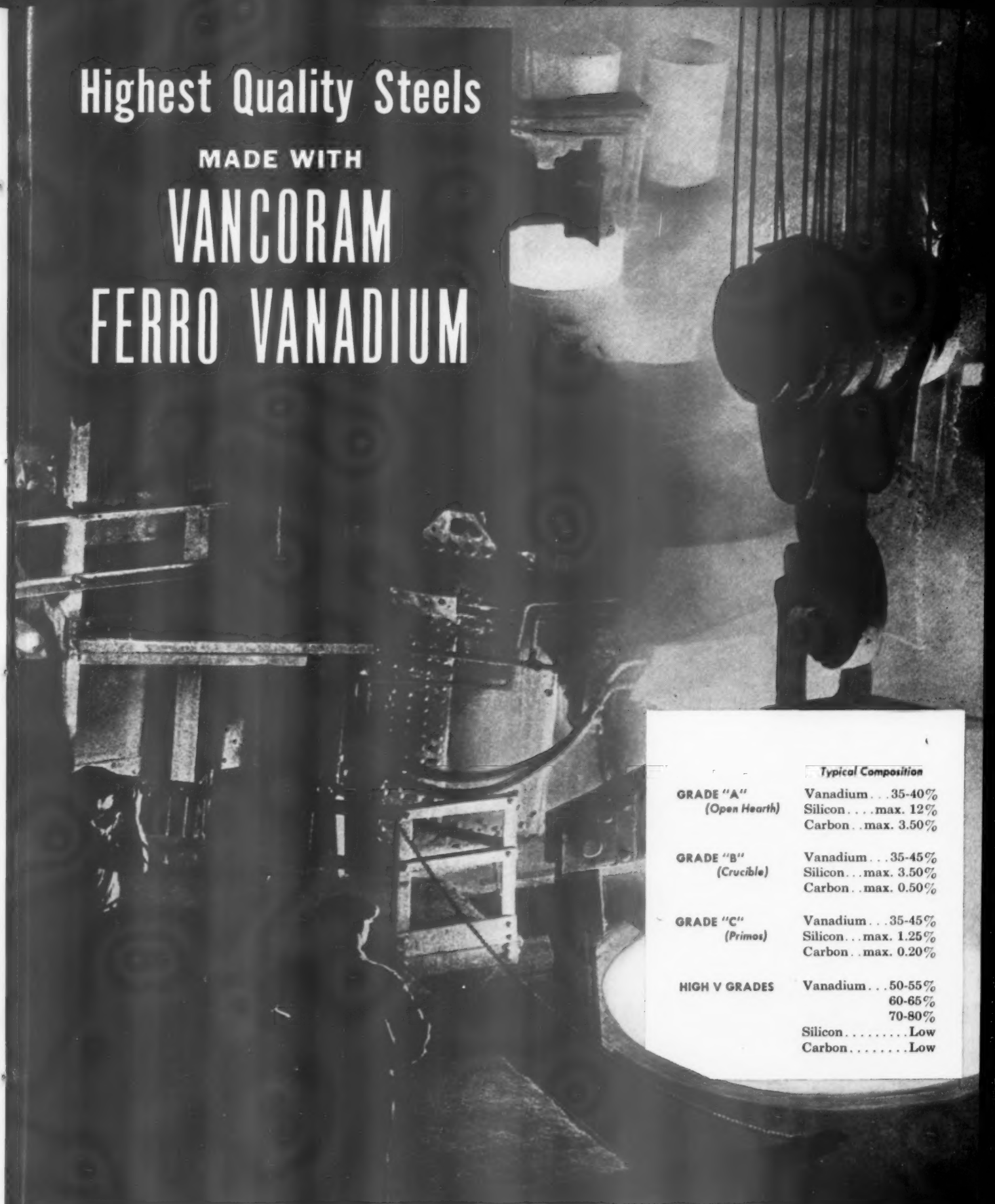

	Typical Composition
GRADE "A" (Open Hearth)	Vanadium . . . 35-40%
	Silicon . . . . max. 12%
	Carbon . . max. 3.50%
GRADE "B" (Crucible)	Vanadium . . . 35-45%
	Silicon . . . max. 3.50%
	Carbon . . max. 0.50%
GRADE "C" (Primos)	Vanadium . . . 35-45%
	Silicon . . . max. 1.25%
	Carbon . . max. 0.20%
HIGH V GRADES	Vanadium . . . 50-55%
	60-65%
	70-80%
	Silicon . . . . . Low
	Carbon . . . . . Low

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(*Continued from page* 138)

4. Zirconium additions improve elevated temperature properties of cast Monel and overcome some of the detrimental effects of lead.

5. Boron contamination causes a reduction in room temperature ductility, although it does have a beneficial effect on tensile properties at 800 to 1000° F.

"Recent Developments in Theory and Practice of Insulating Sleeves, Pads and Risers for Nonferrous Casting" was title of a paper contributed by Kurt A. Miericke, metallurgical development engineer, U. S. Gypsum Co., Chicago. The speaker pointed out that one of three techniques by which directional solidification can be assured consists of so insulating risers and portions of the mold that cooling is retarded in certain areas, and molten metal can be controlled as to rate and amount of feed.

Mr. Miericke stated that Taylor and Wick had accomplished pioneer work in adapting gypsum-base metal casting plaster to this use. Advantages of the practice as reported by them were sounder castings, greater yield and lower cleaning costs.

Until now the material found most suitable for making insulating riser sleeves and pads was the so-called regular metal casting plaster. It had all the desirable characteristics of insulation, but also had the following disadvantages: (1) Lack of permeability; (2) fragility after burnout; (3) susceptibility to blows when used as pads, due to reabsorption of moisture from the molds; and (4) excessive baking time and tendency to reabsorb moisture if not properly stored.

Eliminate The Disadvantages

Development of a new permeable metal casting plaster has eliminated most of the disadvantages of gypsum cement, Mr. Miericke asserted, and when using this material at permeabilities of 15 to 25 AFS, the following advantages can be obtained over regular metal casting plaster: (1) Sleeves and pads may be baked in standard core ovens at temperatures of 275 to 400° F since only the free water need be removed; (2) sleeves and pads will be at least 50 per cent stronger, eliminating excessive breakage while molding; (3) moisture pickup during storage and when rammed in green sand molds is no longer a problem. Sleeves and pads have sufficient permeability to release gases formed. If they are used after long periods of storage the metal contact surfaces may be torched before the molds are closed or before the metal is cast; and (4) permeable metal casting plaster sleeves and pads no longer require storage in dehumified atmospheres.

The roundtable luncheon which the Brass and Bronze Division sponsored on Tuesday was believed to be the best attended of any on record, more than 200 being present. B. A. Miller, Baldwin Locomotive Works, Philadelphia, presided and H. L. Smith, Federated Metals Division, American Smelting & Refining Co., Pittsburgh, served as co-chairman.

General and unreported discussion was keyed to the topic "Some Practical Applications of the Fundamental Principles of Melting, Pouring and Casting of Tin Bronzes." Discussion leaders were as follows: Melting—H. M. St. John, Crane Co., Chicago; Pouring — Co-chairman Smith; Sand—George W. Anselman, Woodruff & Edwards Inc., Elgin, Ill.; and Gates and Risers—G. Bradshaw, Philadelphia Naval Yard, Philadelphia.

By way of introduction to the off-the-record open discussion, Mr. Smith asserted that today no foundryman should reject castings on account of gas porosity because this matter can be controlled. He raised the question as to how we know that porosity is caused by hydrogen and/or carbon, since neither in themselves causes porosity. The two react with oxygen, he asserted, to form water vapor and carbon gases, thus oxygen is the determining factor in gas porosity. Mr. Smith said further that these gases must enter the metal as dissociated products. In conclusion, he stated that producers should work to improve the solidity of nonferrous castings.

STUDIES OF HEAT TRANSFER

Reported by Committee

RECENT investigations by the AFS Heat Transfer Committee were reported at a session presided over by W. K. Bock, National Malleable and Steel Castings Co., Cleveland, with J. B. Caine, Sawbrook Steel Castings Co., Lockland, O., as co-chairman.

The fourth report of the Heat and Mass Flow Analyzer Laboratory regarding solidification of steel was presented by Dr. Victor Paschkis, technical director of the laboratory, Columbia University, New York. Work reported at AFS annual meetings the three previous years included: First, a comparison of predicted progress of solidification of a slab with the progress observed in systematic bleeding tests; second, the influence of different variables (conductivity, specific heat, etc.) on the solidification rate; third, a study of shapes other than slabs.

The most recent investigation has been concerned with the development of solidification curves of a more general nature, covering bodies of various shapes. It was pointed out the comparison of solidification for different shapes will have practical significance, such as in gating and feeding designs, since if relative rates of solidification of different parts of the casting are known, advantage can be taken of this information in design.

The mathematical treatment of heat flow in the center of a large slab perpendicular to its surface, radial heat flow in a long cylinder (no end effects) and radial heat flow in a sphere are similar; although in cylinders and spheres heat flow is two and three dimensional, respectively, the mathematical treatment is of one dimensional nature. The work covered by this report was on such one-dimensional shapes; that is, the end effect of slabs and cylinders was not taken into consideration. However, it is possible to determine ratios of volume to surface area. For the three shapes these ratios for slabs, cylinders and spheres are 1:1/2:1/3.

Two charts of solidification rates summarize the more recent investigation. These charts plot ratios of solidification time of a slab to that of a cylinder and solidification time of a slab to that of a sphere, respectively, against relative positions (surface, half thickness, at center, etc.). Curves also were presented for five different degrees of superheat.

A second paper, also presented by Dr. Paschkis, was concerned with the fundamentals of heat transfer. This explained in simple form the manner in which heat is conducted and the principles of solidification. The paper was described as an introduction to the various published material which has resulted from use of the heat and mass flow analyzer at Columbia University which employs electrical methods for obtaining data on heat flow problems. With the analyzer a thermal process lasting only a fraction of a second can be represented electrically by an experiment lasting many minutes; and conversely, a slow thermal process, lasting hours or even

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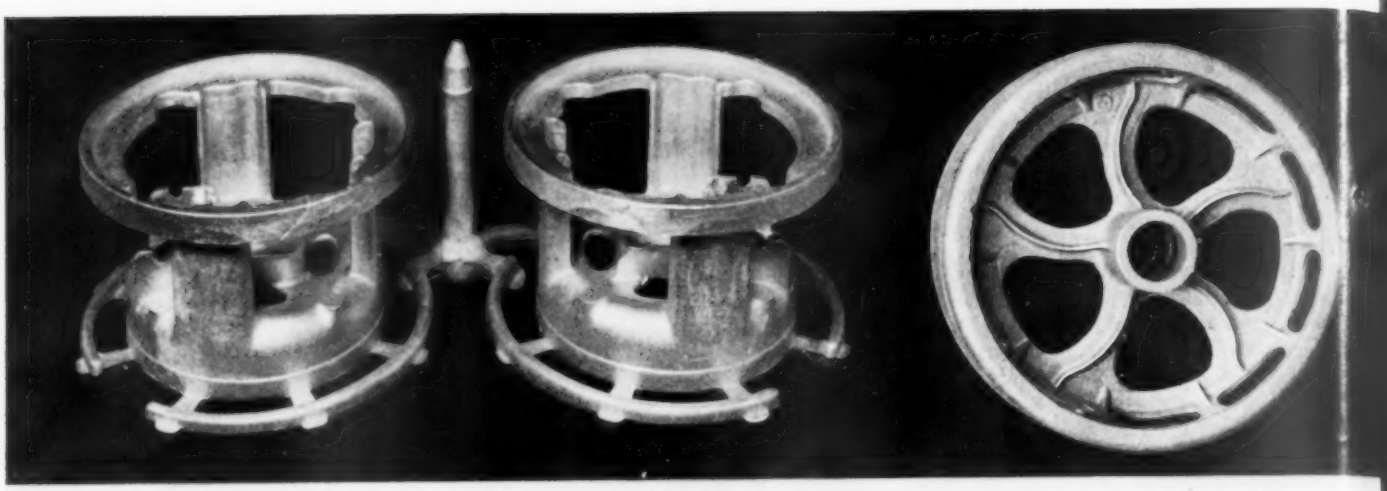

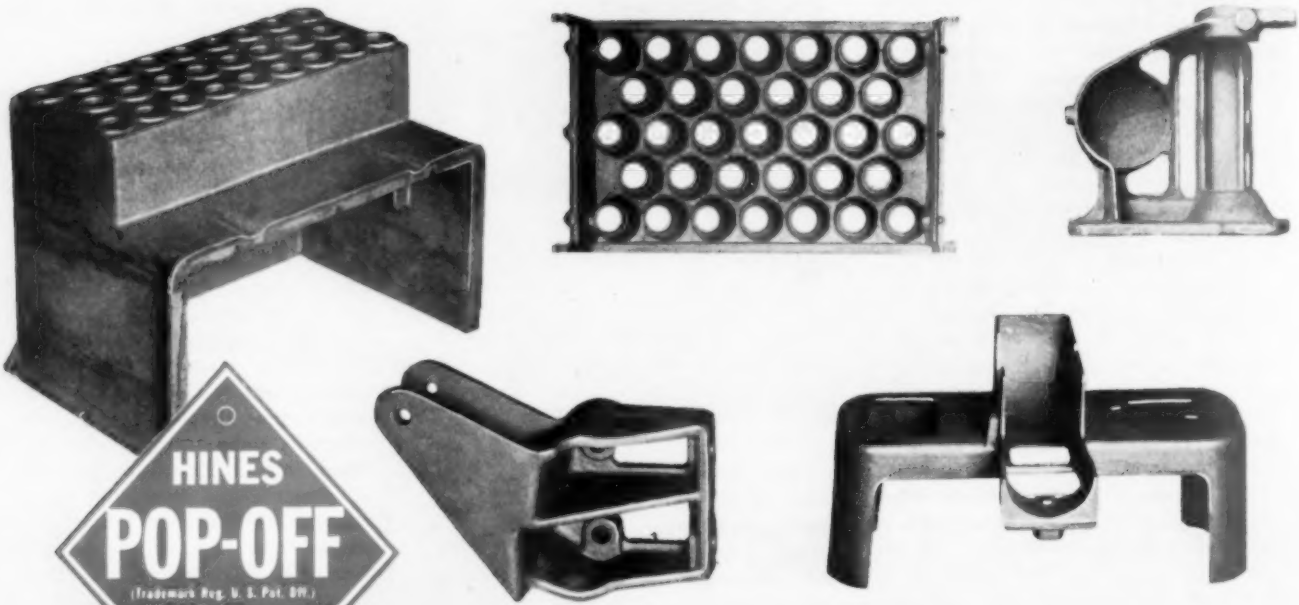

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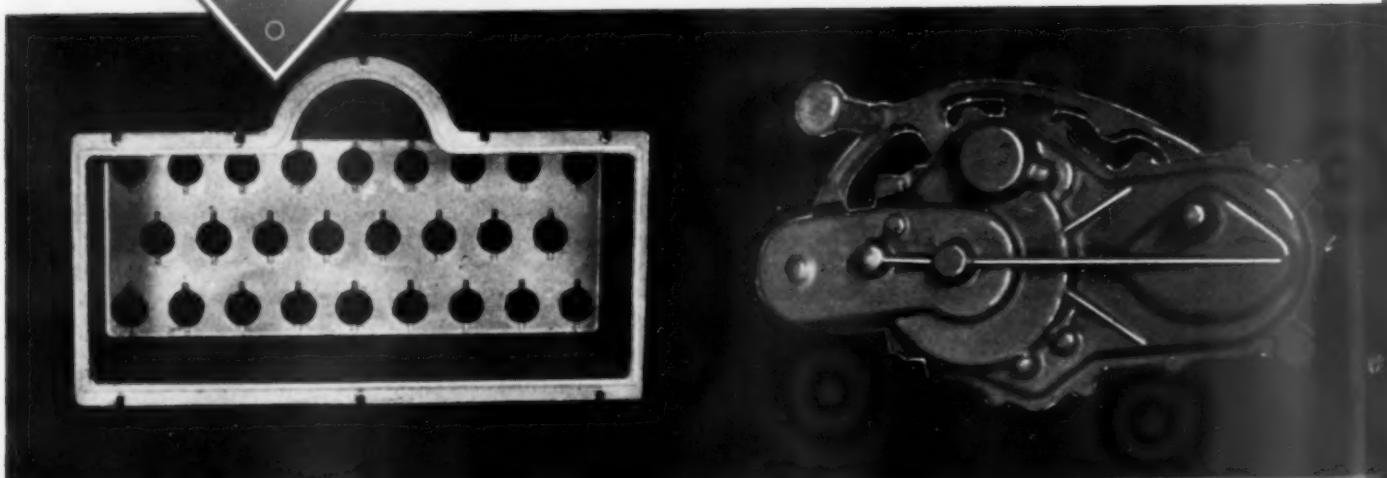

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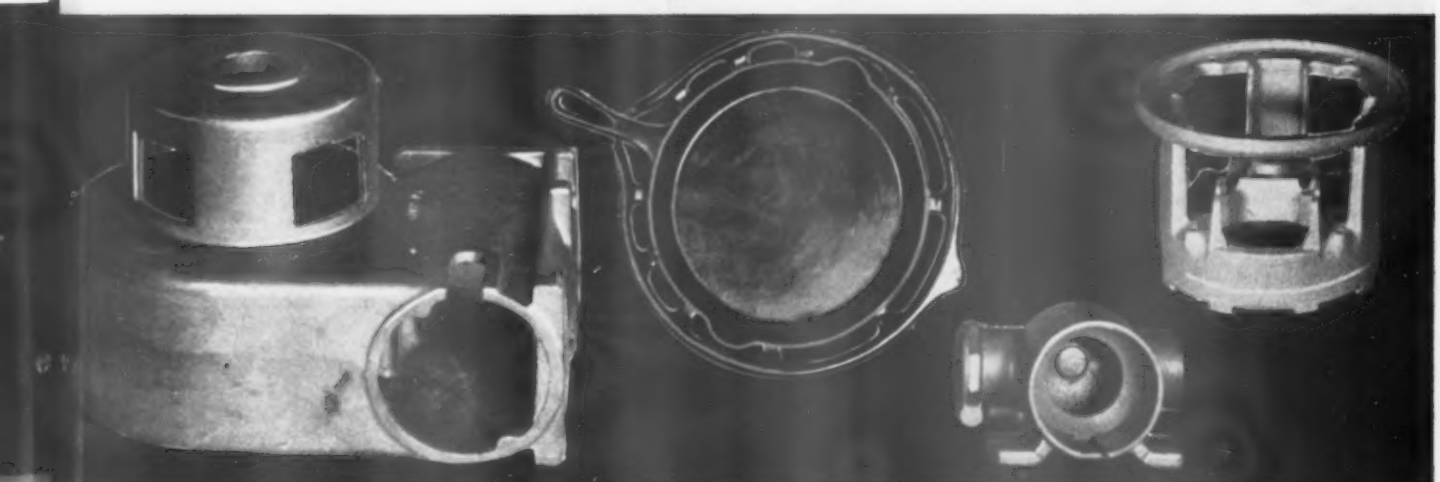

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(*Continued from page* 141)
weeks, can be represented in an electric experiment lasting only minutes or even seconds.

Time Study and Methods Are Discussed

FUNDAMENTALS necessary for developing standard data tables were outlined in a session sponsored during the convention by the Time Study and Methods Committee, conducted by E. G. Tetzlaff, Pelton Steel Casting Co., Milwaukee. J. A. Westover, Westover Engineers, Milwaukee, acted as co-chairman.

M. T. Sell, Sterling Foundry Co., Wellington, O., presented a paper entitled "Developing Standard Data Tables for a Four-Man Molding Unit," using as examples data tables in actual use there. The molding unit consists of four men—a machine operator, operator's helper, finisher and core-up man, and a finisher's helper —operating a pneumatic rollover, jolt and draw machine with a capacity of 1500 lb and a 26 x 10-in. plate, ramming both drags and copes of molds made in 20 x 20, 24 x 24, 18 x 26 and 18 x 36-in. flasks. A view of the molding unit was shown and the speaker analyzed the complete molding operation prior to explaining development of the tables.

Detailed instructions were given for preparation of time study sheets, comparison sheets, plotting of curves showing various elements included in the molding operation, computing of values from the curves and arrangement of the standard values in tables for setting of standards. Factor cards for recording the values for the various factors and elements of work were explained and instructions for a complete write-up when a standard data set-up is ready for application, were given.

The paper was not intended to present in detail the method of taking the time study, method of leveling, speed rating, or method of determining the relaxation allowances. The author explained that these are individual topics and the purpose of the paper was to show the developing of standard data for the molding unit. Standards set by standard data are fair and consistent with like jobs, because the tables have been developed from many time studies taken on different operators and under varying conditons. They may be determined in a short time, permitting 100 per cent standard coverage, which is almost impossible when using the direct time study method.

When using properly developed standard data, the worker develops confidence in the standards that cannot be equalled when using direct time studies. Cost of a job may be determined, and selling price quoted before the job is made. By allowing standards to be set in advance standard data make possible production schedules and machine loading. This is an advantage to both management and men in the plant, because production may be kept at a more even level.

In the discussion following the paper the chairman mentioned that the method used in developing standard data tables for the four-man molding unit could be applied to other operations in a plant. It was also brought out that there may be a slight variance in standard data tables. This is usually due to delay on the part of one of the working group and another stepping in to assist in the work. In reply to a question as to the length of time it takes to develop standard data tables, it was disclosed that 100 studies over a period of three months were taken of several mold operations, to develop these tables. The more studies that are made, with the greater number of variables, the better the data tables that will be secured.

HONORS VETERAN EMPLOYEE: John A. Leisk, right, general superintendent of foundries and pattern shops, Allis-Chalmers Mfg. Co., Milwaukee, was recently presented with a certificate by Harry E. Ladwig, left, works manager, foundries and pattern shops, in observance of 60 years of continuous service with the company. Starting as a molder's helper in 1889, with the old E. P. Allis Co., Mr. Leisk became a molder apprentice, molder, and assistant foreman. He served as superintendent of foundries before taking over his present post in 1934. He is a native of Lerwick in the Shetland Islands, north of Scotland

Stress Importance of Safety and Hygiene

TWO papers were included in the program sponsored by the Safety and Hygiene Committee, at which Lee C. Wilson, Reading, Pa., presided, and J. R. Allan, International Harvester Co., Chicago, acted as co-chairman, with about 200 in attendance.

In his paper, "Attracting and Keeping Good Men in the Foundry," G. E. Tubich, engineer, Michigan Department of Health, Grand Rapids, presented some factors of safety and health, labor turnover, and human relations in the foundry industry. Silicosis results from breathing air containing "free silica" dust. The action of this type of dust in the lungs replaces normal lung tissue

(*Continued on page* 146)

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(*Continued from page* 144)

with fibrous or scar tissue. Dust particles capable of producing silicosis are usually less than 5 microns in size. Good housekeeping is one of the most valuable assets in attracting desirable foundry personnel, and adequate sanitation facilities should be provided.

Over 90 per cent of foundry accidents involved unsafe working conditions and unsafe personal acts. Well planned safety and health programs result in substantial reduction of accidents, in the incidence of occupational disease, labor turnover and absenteeism. An interesting point was brought out in the discussion following the paper. Apart from management's co-operation to provide employees with information on the importance of adopting hygienic measures it was indicated the worker must be willing to accept these ideas. Posters in plants, insisting that workers use safety measures that are provided, were recommended. Mr. Tubich stated an educational program is necessary to impress workers with the importance to taking advantage of hygienic measures. For example, if management is willing to provide safety glasses, and other protective equipment, foundrymen must be willing to use them.

In the second paper, "Industrial Hygiene in the Foundry," Herbert J. Weber, American Brake Shoe Co., Chicago, pointed out specific steps that small foundries may adopt to stamp out occupational disease. These included good housekeeping, which includes cleaning out years of accumulation of dust and dirt. Application of wetting agents reduce dust and improve working conditions. Installation of good illumination, local exhaust systems, first aid rooms, nursing service, all aid in overcoming unsuitable working conditions. Plants should avail themselves of services of state departments which will survey plants and make helpful suggestions on how best to control hazards.

Changes in ventilation, working the shakeout crew at night, and walling off the cleaning room may result in reduced insurance rates as well as improvement in working conditions. Pre-employment physical examinations are a protection against payment for silicosis contracted elsewhere and as a guide to proper job placement of new employees. Periodic physical examinations are important. In conclusion Mr. Weber stated the greatest weapons against occupational disease are willingness on the part of top management to correct poor conditions and good housekeeping.

Mr. Allen, the co-chairman, commented on the papers. He cited action on the part of cities like Chicago, Cleveland and others to study fume correctment, dust arrestment and public safety of city populations. In many states employees cannot be made to co-operate and these must be led. Labor is demanding new measures to protect workers. However, it is preferable for management to provide clean and healthy working conditions now without waiting for compulsory adoption of good housekeeping practices.

YOUTHS AND THE FOUNDRY

Educational Session Topic

CONVENTION sessions of the Educational Division included a dinner session and the annual luncheon of engineering school graduates. At a business session of the division, A. W. Gregg, Whiting Corp., Harvey, Ill., was elected chairman for the ensuing two years, succeeding Fred G. Sefing, International Nickel Co., New York. B. D. Claffey, Acme Aluminum Alloys Inc., Dayton, O., was elected vice chairman of the division.

Mr. Sefing presided at the Monday dinner session, with Mr. Gregg as co-chairman. Discussion of the subject, "How to Interest Our Youth in the Foundry Industry," was presented from the viewpoint of industry by Fred B. Skeates, Link-Belt Co., Chicago, and from the viewpoint of education by E. E. Greene, Indianapolis public schools.

Mr. Skeates pointed out the need for additional trained men in the foundry industry, citing, for example, how relatively few foundries are equipped for sand testing and the maintenance of physical controls. He emphasized that a good training program in the individual foundries is the best way to interest young students in the industry as a career. He stated that the preferred way to make contacts with young boys is through the schools, and emphasized the importance of foundry management becoming acquainted with the foundry instructors in the institutions. He recommended further that the instructors be invited to visit the foundries together with their students and that the foundries interest themselves to see that the schools which give foundry instruction are provided with modern equipment.

When boys are hired, they should be provided a clear understanding of the training program to be given them, and this program should be followed carefully. Mr. Skeates was of the opinion that whether students are obtained from vocational training or academic high schools is less important than the type of training they are given by the foundry. He also recommended that promising trainees be sent to college if they give evidence that they would be of additional value to the company through the further training provided them by higher education.

Skilled Molders Are Scarce

Mr. Greene presented some interesting information obtained as a result of a survey made in Indianapolis for the purpose of determining what training facilities are needed by the foundry industry. This survey showed that out of 4321 foundry employees, only 151 were classed by the foundries as skilled molders. An additional 489 were listed as machine molders and 9 as apprentices.

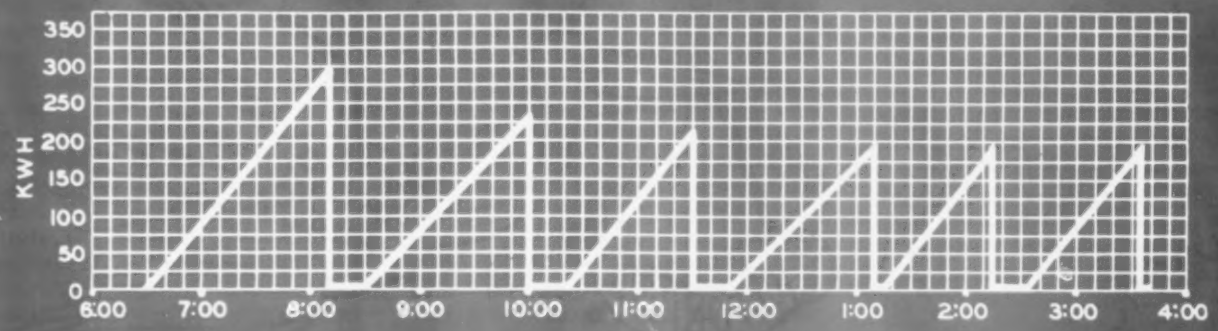
These data indicated that training is needed for only 15 per cent of all foundry employees. This has resulted in part from foundry mechanization which puts less emphasis on the need for skilled molders and transfers the requirements for industrial know-how to foremen, superintendents, etc. The survey showed that newer foundries have no training or up-grading programs, and such foundries have indicated that they do not need any. Another point developed by the survey was that a large number of students leave high school at the age of 16, but since by law they are prevented from entering the foundry industry until they are 18, they may enter nontechnical work which usually results in their showing no interest in foundry employment when they reach the age to enter the industry.

Stowell Wasson, National Malleable & Steel Castings Co., Cleveland, commented on foundry training programs and urged that department heads be placed in charge of such programs. Experience has shown, he indicated, that under such an arrangement the programs are most likely to be followed through successfully.

Some aspects of training engineers for careers in the foundry industry were discussed at the Engineering School Graduates luncheon held Wednesday under sponsorship of the

(*Concluded on page* 149)

DETROIT ROCKING ELECTRIC FURNACE



NOTES ON DAILY OPERATION OF TYPE LFY, 700-LB. CAPACITY DETROIT ELECTRIC FURNACES MELTING NICKEL:

TOTAL HOURS OPERATION—9¼ hrs.; NUMBER OF HEATS—6; WEIGHT PER HEAT—900 Lbs.; TOTAL METAL MELTED—5450 Lbs.; TOTAL KILOWATT HOURS—1323; KILOWATT HOURS PER TON—486.

PROFITS FROM DETROIT ELECTRIC FURNACE OPERATION IN PAST YEAR: $150,000.00.

NOTES ON TWO-YEAR OPERATION OF SAME FURNACES:

COMPANY—A Well-Known Automotive Plant (name on request); PERIOD—(Sept. 9, 1946 to Sept. 18, 1948); TOTAL TONNAGE MELTED—1,070; AVG. ELECTRODE USAGE—8.65 Lbs. per Ton of Nickel at .23/Lb.—$1.99; AVG. POWER CONSUMPTION—625 KWH/Ton at 1¼c—$7.81; AVG. REFRACTORY COST—$4.00/Ton.

AVG. TOTAL MELTING COST OVER TWO YEARS: $13.80 PER TON.

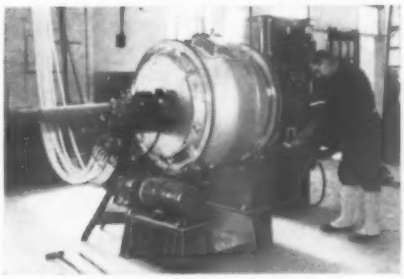
Maximum QUALITY CONTROL • *Low* MELTING COST

FOR FERROUS AND NON-FERROUS METALS

This record is typical of annual savings obtained with Detroit Rocking Electric Furnaces. An important additional advantage is the fine degree of quality control obtained in every melt.

Other economical features are: optimum power use and all-electric operation eliminating handling and storing of messy, bulky fuels; positive control of melting speed, quality and composition; exact duplication of previous melts; and control of other melting factors. Out-of-production time is minimal. Burned-out linings are quickly, easily replaced by spare, previously-lined furnace shells.

Fast, always uniform outputs and low metal losses by shrinkage save production time, labor and expense. Shop borings, turnings and scraps are reduced with least loss from oxidation.



The electric arc is automatically established clear of the molten bath at all times. The metal never becomes a part of the electric circuit. This method assures uniform temperatures within the melting chamber.

Detroit Rocking Electric Furnaces are available with automatic electrode control and automatic rocking control. There is a wide range of sizes to choose from . . . from 10 to 4000-lb. capacities. Chambers are of conical or cylindrical type. All furnaces are individually designed to meet your plant electrical specifications.

Let our engineers send you all the facts on how you reduce melting costs the year around, with the Detroit Rocking Electric Furnace. Send us your pertinent production data and we will show you the ultimate in operating economy and positive quality control with the Detroit Rocking Electric Furnace suited to your requirements in size, use and capacity. Write:

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Put more opportunity into your company's future

WITH THIS FIVE-STEP PROGRAM

Here's an easy-to-follow program that will substantially increase your company's chances for a prosperous future.

Nation-wide experience in 20,000 companies proves that this popular program also pays off handsomely *today*. It increases each participating employee's peace of mind—making him a more contented, more productive worker. It reduces absenteeism, lowers accident rates, increases output, and improves employee-employer relations!

This program is simply a proved formula for building membership in the Payroll Savings Plan—the "automatic" system by which millions of workers are investing in U. S. Savings Bonds every pay-day.

What Are the Five Steps?

The benefits of the Payroll Savings Plan to your company are in proportion to the percentage of employees who participate. Nation-wide experience indicates that 50% of your employees can be persuaded to join *without high-pressure selling*. Here are five steps which have proved to be the "magic formula" for putting over the Plan. They will get results for you:

1. See that a top management man sponsors the Plan.
2. Secure the help of the employee organizations in promoting it.
3. Adequately use posters and leaflets and run stories and editorials in company publications to inform employees of the Plan's benefits to them.
4. Make a person-to-person canvass, once a year, to sign up participants.

These first four steps should win you 40-60% participation. Normal employee turnover necessitates one more step:

5. Urge each new employee, at the time he is hired, to sign up.

Check up on the Payroll Savings Plan in your company. If fewer than half of your employees are participating, you have a lot to gain by following the five-step program outlined here. All the help you need is available from your State Director, U. S. Treasury Department, Savings Bond Division. While it's on your mind, why not call him right now? Or write the Treasury Department, Washington 25, D. C.

Are You With It?

In the current national Savings Bonds campaign, May 16-June 30, the Treasury Department asks each company operating the Payroll Savings Plan to canvass all employees, with the goal of having at least half of them signed up by the end of the month. This advertisement tells how you can achieve that goal most easily.

The Treasury Department acknowledges with appreciation the publication of this message by

THE FOUNDRY

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.

(*Concluded from page* 146)

Educational Division. Fred G. Sefing, division chairman, spoke a word of greeting and introduced C. J. Freund, dean of engineering, University of Detroit, Detroit, who presided.

Among the speakers participating in the discussion were John Grennan, foundry instructor emeritus, University of Michigan, Ann Arbor, Mich.; John M. Price, president, Ferro Foundry & Machine Co., Cleveland; Prof. John Wulff and Prof. Howard F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass.; A. W. Gregg, consulting engineer, Whiting Corp., Harvey, Ill.; and R. E. Kennedy, foundry instructor, Navy Pier Branch, University of Illinois, Chicago.

Dean Freund commented that at one time not-too-distant, theory was frowned upon in the foundry. Today, there is by necessity an accelerating trend in the opposite direction. The transition came when the metallurgist was called upon for assistance in connection with metal problems. Following this, theory was applied to sand, raw materials, gating and risering, and similar matters, and the speaker said no one would think of turning back now.

Much of the discussion revolved around the excellent work being accomplished by the Foundry Educational Foundation and the group of technical schools co-operating in its program. Mr. Price, one of the prime movers in the FEF, asserted that mass production methods destroy pride in craftsmanship and posed the question as to where the foundry industry is going to get its future engineers and managers. The foundation and its operation are assured for the initial three-year period. It was the consensus that the program must be continued and that industry will find it to its best interests to provide the capital to make continuance possible.

SESSION ON FOUNDRY COSTS

Describes Effective Methods

A COMPREHENSIVE paper, "Approach to Standard Costs in the Foundry," describing establishment of a cost system and emphasizing the need for this information in successful foundry management was presented at the Cost Committee session by Fred Ruffolo, Westover Engineers Inc., Milwaukee. Chairman of the meeting was Ralph L. Lee, Grede Foundries Inc., Milwaukee, with George Tisdale, Zenith Foundry Co., Milwaukee, co-chairman.

Mr. Ruffolo defined standard costs as being simply predetermined costs which are established by scientific methods and cover material, labor and expenses. The concept of the cost system is to flag excess cost or variations from standard. Labor is generally chosen as the first step in the standardization program and these standards are based on time and motion studies. The categories which labor includes are: Direct labor, which is time of an employee that can be identified and charged to the customer; process labor, identifiable only with a particular process or department; and indirect labor.

Standards for materials apply both to price and quantity. Under the standard cost system, the customer is charged a predetermined rate per pound for materials, according to the analysis required. However, the actual purchases of materials may be at varying rates depending on market conditions. The cost of materials based on predetermined standards and the cost of materials as charged to the customer on the job order cost sheet may thus differ because of difference in prices. This element of difference is called a price variance and may be handled in two ways. The expense standard provides the measure for ascertaining the allowable expense at any level of production; otherwise it cannot be termed a standard. These are best developed after experience data for several months has been recorded on the books under the new burden centers and expense classification.

In discussing specific job costs, Mr. Ruffolo stated that in order to sell at a profit, management must be provided with dependable data to estimate the jobs when quoting a customer and to compare the estimate with the cost when the job is run. These two functions should be of interest to all foundries regardless of financial success. In further describing a standard cost system, Mr. Ruffolo discussed budget statements, estimating and account classification. In conclusion, he pointed out that, even though some accounting problems as presented by the industry have not yet been solved, the margin of error in costs obtained through the system outlined is negligible as compared with composite averages or unanalyzed costs.

In the discussion following the paper, Mr. Ruffolo emphasized the need of establishing labor standards as a firm foundation for a standard cost system. His advice was to establish operation standards based on today's operations and go forward from that point, making adjustments where necessary, rather than to endeavor to establish a system based on past business experience. He cautioned, however, that any system for analyzing costs is only as good as the accuracy of information received in the accounting department.

A "normal" or "break-even" point will be fair both to the producer and to the consumer regardless of whether the plant is operating at peak capacity or at 50 per cent of capacity. The over-absorption of overhead during high production periods should enable the plant to operate for a time at less than the "normal" rate. However, it sometimes proves necessary to analyze the structure on the basis of current operating conditions and adjust the figures to meet the new requirements.

Reports on other technical sessions held during the AFS convention at St. Louis will be presented in the July issue.

Book Review

The Story of Magnesium, by W. H. Gross, 260 pages, 4" x 7½", published by the American Society for Metals, Cleveland. Price $1.50.

This is one of a series of books published by the society to provide technical information on metals and metallurgical processes for the practical man. As pointed out by the author, who is a member of the Technical Service Department of the Dow Chemical Co., the size of the book does not permit a thorough discussion of all phases of the subject, but an effort has been made to give the reader a comprehensive understanding of the technological aspects of the magnesium industry.

Foundry workers will be particularly interested in the chapter on "Castings," which considers sands and sand agents, cores, chills, molding practice, shake-out and cleaning operations, impregnation, heat treatment, permanent mold castings and die castings.

The remaining text covers a general introduction of the subject, the history of magnesium production; sources and methods of extraction; equipment and methods of alloying, melting and refining; fabrication other than casting; machining; joining; surface finishing; physical metallurgy and uses of magnesium.

AFS Elects New Officers and Directors

AT the annual business meeting of the American Foundrymen's Society at St. Louis, May 4, Edwin W. Horlebein, president of the Gibson & Kirk Co., Baltimore, was elected president for 1949-50 to succeed William B. Wallis, president of the Pittsburgh Lectromelt Furnace Corp., Pittsburgh. Walton L. Woody, vice president of the National Malleable & Steel Castings Co., Cleveland, was elected vice president of the society. The new executives will take office following the annual meeting of the board of directors this summer.

As retiring president, Mr. Wallis will serve as director for one year, while five new directors were chosen for three-year terms. They are: Thomas E. Eagan, chief metallurgist, Cooper-Bessemer Corp., Grove City, Pa.; Lloyd C. Farquhar, works manager, American Steel Foundries, East St. Louis, Ill.; Vincent J. Sedlon, president, Master Pattern Co., Cleveland; Frederick J. Sefing, research metallurgist, International Nickel Co., New York, and Lloyd D. Wright, manager, United States Radiator Co., Geneva, N. Y.

Edwin W. Horlebein

EDWIN W. HORLEBEIN, president of the Gibson & Kirk Co., Baltimore, is a native of that city and received his first technical training at its Polytechnic High School. His active career in industry began in 1915 when he became a machinist apprentice with the Baltimore & Ohio Railroad. It was interrupted for a year while he served as a lieutenant in the field artillery during World War I, after which he joined the engineering department of the Dixie Mfg. Co., Baltimore. Mr. Horlebein has been associated with the Gibson & Kirk Co. since 1924 when he became its president. A charter member and first chairman of the Chesapeake Chapter of the AFS, Mr. Horlebein has also served on the executive committee of the society's Brass and Bronze Division. He was elected a national director of AFS in 1945 and vice president a year ago. He holds memberships in several American technical organizations and the British Institute of Metals, and is a past president of the Non-Ferrous Founders' Society.

Walton L. Woody

WALTON L. WOODY, vice president of the National Malleable & Steel Castings Co., Cleveland, has been associated with that organization since his graduation from Rose Polytechnic Institute, Terre Haute, Ind., in 1914. A graduate chemical engineer, Mr. Woody was transferred from the Indianapolis plant to Cleveland, shortly after joining the company, to establish its first chemical laboratory. He later became metallurgist and assistant superintendent of the Cleveland plant, and in 1925 was named plant manager. During 1926 he served in a similar capacity in Chicago, but returned to Cleveland that same year and remained until 1938 when he was appointed manager of the company's plant in Sharon, Pa. Under Mr. Woody's direction, substantial expansion programs there and at the Melrose Park works were undertaken. In 1943 Mr. Woody was elected to his present position as vice president in charge of operations. Long active in the work of the American Foundrymen's Society, Mr. Woody was the first president of the Northeastern Ohio Chapter, served as a national director from 1942 to 1945 and has been a member of various committees of its Mallable Division.

Thomas E. Eagan

THOMAS E. EAGAN, associated with the Cooper-Bessemer Corp., Grove City, Pa., is its chief metallurgist. He was graduated from Columbia University, New York, in 1923, obtained a bachelor of science degree in metallurgy in 1925, and three years later was granted a metallurgical engineering degree from the Missouri School of Mines and Metallurgy, Rolla, Mo. His first position was as assistant metallurgist in 1925 with Simonds Saw & Steel Co., Lockport, N. Y., and he joined Crucible Steel Co., Harrison, N. J., the following year. Mr. Eagan next became assistant superintendent of research for the Midvale Co., Philadelphia, holding that position from 1927 to 1934 when he joined Cooper-Bessemer Corp. He is well known in the industry through his contributions to the technical press and his talks before various chapters and professional organizations. He is immediate past chairman of the Gray Iron Division of the American Foundrymen's Society and also has served on committees of other technical organizations, including the American Society for Metals, the Society of Automotive Engineers and the American Society for Testing Materials. He recently received national recognition for his development and use of the cast Meehanite crankshift in the diesel engines manufactured by the Cooper-Bessemer Corp.

Lloyd C. Farquhar

LLOYD C. FARQUHAR, works manager of the American Steel Foundries, East St. Louis, Ill., is a native of Indiana and a mechanical engineering graduate of Purdue University, West Lafayette, Ind., 1910. Upon graduation, he joined American Steel Foundries at its Granite City, Ill., plant, serving as an engineer. From 1914 to 1920 he was with Allegheny Steel Co., Pittsburgh, and during World War I served as a captain in the Army Ordnance department. Mr. Farquhar rejoined American Steel Foundries in 1920 as an assistant works manager, and during the following 19 years served both at East St. Louis and at Granite City. He was appointed to his present position as works manager at East St. Louis in 1939. A member of the American Foundrymen's Society since 1938, Mr. Farquhar has served two terms of three years each on the board of directors of the St. Louis District Chapter.

Vincent J. Sedlon

VINCENT J. SELDON, president of the Master Pattern Co., Cleveland, has had a broad experience covering 35 years in the patternmaking industry. Born in Philadelphia, his industrial career has been centered in Cleveland where he was associated with a number of companies in patternmaking work prior to his founding the Master Pattern Co. in 1930. Mr. Sedlon is a past chairman of the AFS Patternmaking Division and a past president of the Pattern Manufacturers Group of the Associated Industries of Cleveland. He has been active as a writer for the technical press on the subjects of permanent molds and patternmaking, and as a

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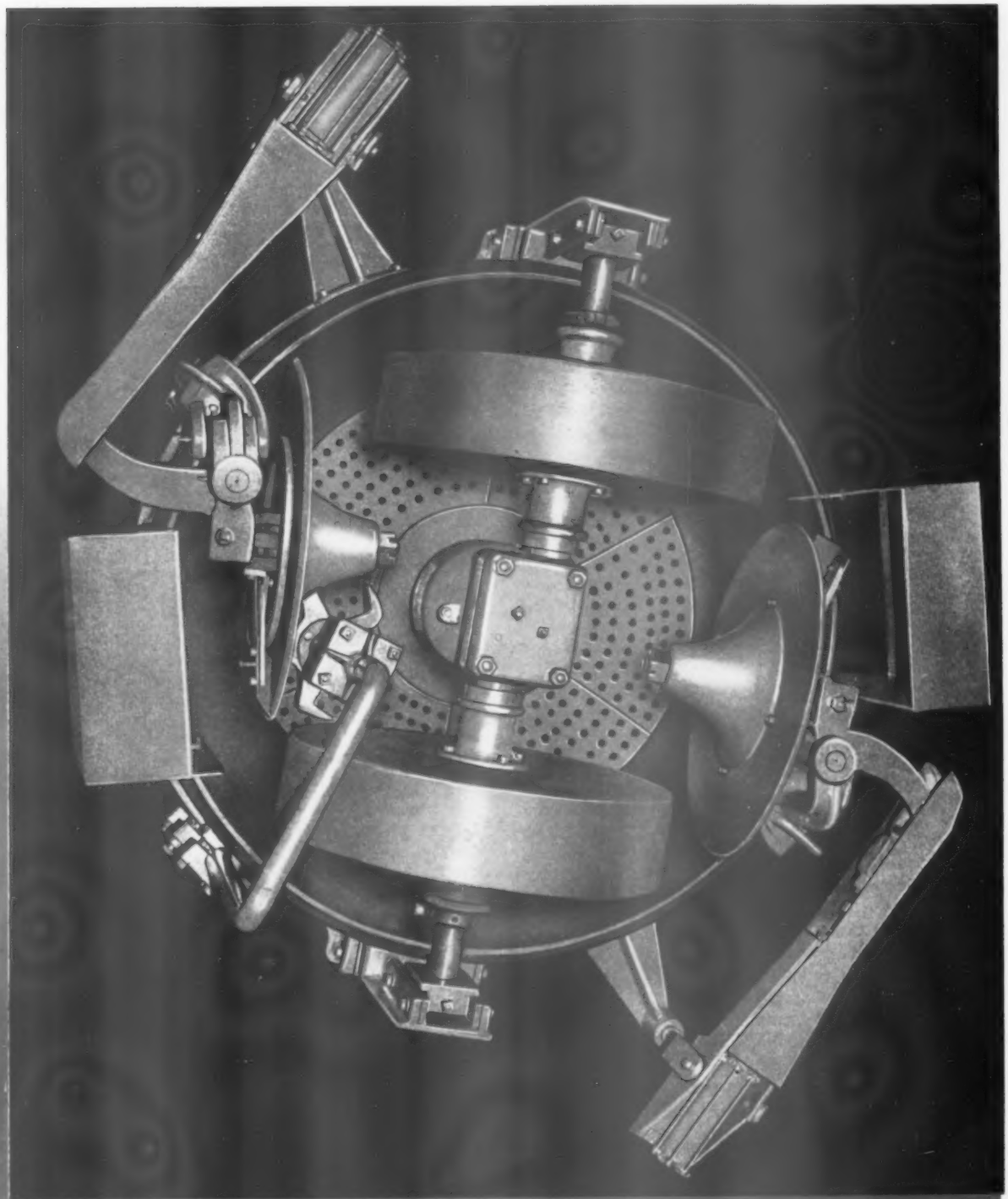

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(*Concluded from page* 150)

speaker before AFS chapters. Mr. Sedlon is a director of Northeastern Ohio Chapter of the AFS.

Frederick G. Sefing

FREDERICK G. SEFING, research metallurgist, International Nickel Co., New York, has been closely identified with the educational activities of the American Foundrymen's Society for many years, serving as a member of its Committee on Co-operation with Engineering Schools, and for the last two years as chairman of the Educational Division. Mr. Sefing was graduated from Lehigh University, Bethlehem, Pa., in 1919, and in 1924 received a master of science degree from Pennsylvania State College. For two years following graduation he was connected with the Hudson Motor Car Co., Detroit, and the Rockford Drop Forge Co., Rockford, Ill. Joining the staff of Michigan State College in 1924 as assistant professor of metallurgy, Mr. Sefing two years later established a curriculum in industrial metallurgy and directed the instruction of that course. Mr. Sefing has been Associated with International Nickel since 1937. One of the founders of the Metropolitan Chapter of the AFS, he is also a past chairman of that group.

Lloyd D. Wright

LLOYD D. WRIGHT, who is manager of the Geneva, N. Y., plant of the United States Radiator Corp., has been associated with that organization since 1922. His first position was as foundry foreman at the Dunkirk, N. Y., plant. The following year he was transferred to Detroit where he served as general foundry foreman for four years, being named foundry superintendent at Geneva, N. Y., in 1927 and appointed to his present position in 1931. Mr. Wright was active in the organization of the Central New York Chapter of the AFS, serving as secretary during its formation. Continuing in that capacity for two years, he was elected chapter chairman and served two terms.

Book Review

Properties of Soft Solders and Soldered Joints, by J. McKeown, published by British Non-Ferrous Metals Research Association, London. Price 17s 6d.

Information on the mechanical properties of tin economy solders and joints made in them is presented in this book, which contains conclusions drawn from experimental work in that field. Tests were carried out over a series of temperatures, including tests on the creep properties of joints made with a range of solders. In addition, comparison was made (by soldering, area of spread and capillary penetration tests) of high-tin and tin-economy solders.

Specification Review Made by ASTM

MANY new specifications and tests for materials and numerous revisions were completed during the American Society for Testing Materials Committee Week held in Chicago. Much new research work was discussed at the 300 meetings of the Society's technical committees. Registration total was over 1100.

Committee A-3 on Cast Iron and its subgroups held well attended and successful meetings and a number of interesting items developed. Subcommittee XIX on Chilled and White Iron Castings was reactivated with G. L. Richter appointed as the new chairman. The specification on pig iron (A43) was carefully reviewed and recommended to be continued as tentative. Simplification of the grades and extension of the silicon ranges for silvery iron are contemplated.

The Subcommitee on General Castings arranged for data on brinell tensile strength relationship in the form of a chart to be added to the specifications for Gray Iron Castings (A 48). A study and critical review of the test bar technique for the transverse test was scheduled as a future activity. There was a review of the extensive impact test studies recently completed and plans were approved for publication of this information on the various test methods in the annual Committee A-3 report. This should offer very interesting data on impact test methods for cast iron.

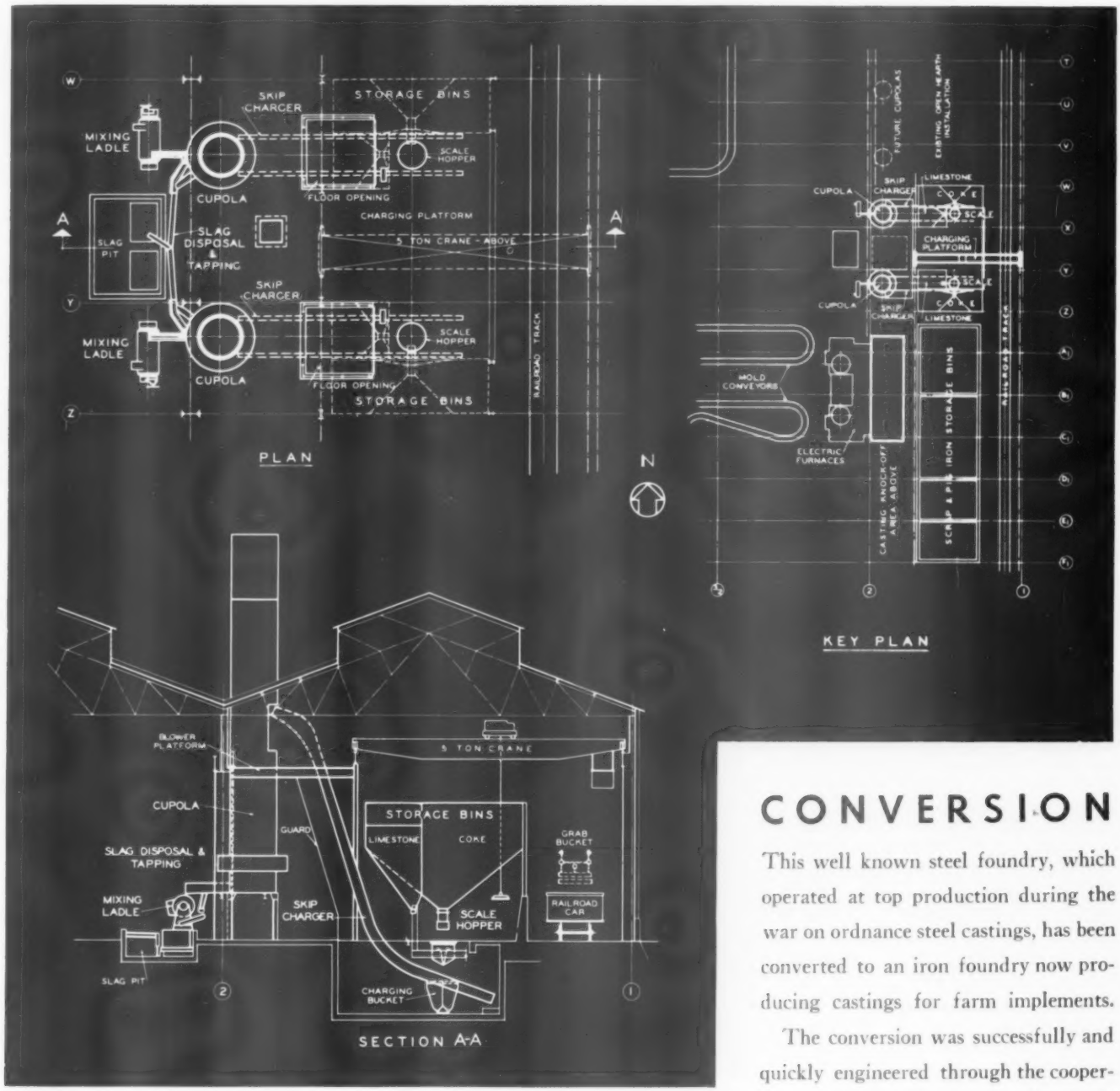
The committee has scheduled further co-operative tests to accumulate data on the various individual test methods and machines with the view eventually of developing a tentative specification. The Charpy and the British Izod single blow test and the repeated drop test will be further correlated. For the Research Committee, J. S. Vanick reported completion of the extensive technical program on the stress-strain testing of cast iron to be presented at the 1949 ASTM meeting in Atlantic City beginning June 27. Fourteen individual contributors have prepared the papers and an interesting discussion on this new testing technique is promised. Committee A-3 also proposes to sponsor a symposium on the properties, testing and use of cast iron for presentation at the San Francisco meeting to be held in October.

Several subcommittees of Committee A-10 on Iron-Chromium, Iron-Chromium and Related Alloys participated. Although the Subcommittee on Classification of Data held no formal meeting, it reported that all the revised material for the A-10 Data on Both Cast and Wrought Alloys was now in hand and will be ready for publication soon. The Subcommittee on Specifications for Castings effected final reconciliation between Specifications for Corrosion-Resistance Iron-Chromium and Iron-Chromium-Nickel Alloy Castings for General Application (A 296) and Heat-Resistant (A 297) and the alloy composition limits published by the Alloy Castings Institute. The matter of a uniform alloy designating system was discussed and steps taken to co-ordinate any action to be taken by the committee with similar action by Committee A-1 on Steel and Committee B-4 on Electrical Heating, Resistance, and Related Alloys.

Eliminate Code Differences

After further study of proposals advanced by Frankford Arsenal and others, it appears that Committee B-7 on Light Metals and Alloys may be able to eliminate small differences now existing in type of code designations applied to aluminum and magnesium alloys. The committee aims to arrive at a code which will be logical and easy to apply and also will have a maximum of flexibility. The committee reviewed almost all of its magnesium specifications and eliminated one sheet and three casting alloys which are no longer in commercial production and added one new casting alloy.

Committee A-1 on Steel held its three-day session in Pittsburgh on Jan. 24-26 and reviewed existing specifications to bring them up to date. A specification consolidating the essential grades found in the present specification A 157 for Alloy-Steel Castings for Valves, Flanges and Fittings for High-Temperature Service and A 217 for Alloy-Steel Castings Suitable for Fusion Welding for High-Temperature Service is well under way. When this is adopted it is expected to supersede specifications A 157 and A 217. Various revisions are contemplated for specifications A 182 covering steel for high-temperature piping accessories, including revised chemical and physical requirements for grade F22 and a clearer definition of the various heat treatments given the austenitic steels.



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By A. H. ALLEN
Detroit Editor
THE FOUNDRY

AROUND Detroit

Ford shutdown puts further damper on foundry operations as jobbing shop operations continue to lag . . . Aluminum sand casting is heart of new automatic transmission unit

OUTLOOK for the castings industry grew dimmer with the walkout of 62,500 employees of the Ford Rouge and Lincoln plants on May 5. Every department from blast furnaces and coke ovens to the final assembly line ground to a stop, although the UAW-CIO permitted a few hundred maintenance men to remain on the job in order that heat might be kept on blast furnaces, coke ovens, open hearths, glass plant furnaces and other continuous 7-day processes where heavy damage might result from shutoff of heat and power. Foundry cupolas were tapped out and all metal poured or pigged shortly after the strike deadline. Production loss figured to about 21,000 passenger cars and 5000 trucks weekly, and field stocks amounted to little more than 15,000 vehicles of all descriptions.

The disastrous shutdown not only turned the spigot on Ford's own 2300-ton daily foundry production but immediately stopped all shipments of parts and materials received from outside sources, which included a number of foundries which have been leaning heavily on automotive accounts. Instructions were issued to suppliers to continue fabricating on releases through May 13 but after that to suspend until further notice.

The Rouge closing rapidly pyramided to include all far-flung assembly plants around the country, ultimately idling an estimted 147,000 employees, not counting 7200 dealers and their 100,000 personnel and perhaps another 50,000 who faced layoffs in supplier's plants. The sad part of the affair was that the sole point of dispute leading to the ill-timed strike concerned the speed of final assembly lines in the Rouge and Lincoln plants where only 2500 were working. They objected to the policy of increasing line speeds to make up for shutdowns occasioned by materials shortages, power failures, equipment breakdown, etc. Such temporary acceleration, when it was required, amounted to only 5 per cent beyond established work standards and was designed simply to permit maintaining daily projections of completed cars.

The union cry of "speed-up" is as old as the labor movement itself and has become critical in numerous other automotive and parts plants besides Ford. For its part, management is bending every effort to get costs down and to keep production lines moving at the full rate called for by work standards. Union members, on the other hand, accustomed to frequent periods of loafing over the past three years because of materials shortages and other delays, now are objecting to maintaining a steady pace, labeling it the old "inhuman speed-up" which it is not but which makes a handy phrase to sell the membership.

What is the cure for this rash of unrest in the ranks of automotive and parts company labor? Unfortuantely, it looks like it would have to be cold, hard economics. If the protesters over fancied speed-ups could take a look around the country in industrial areas not predominantly automotive and see the thousands who have been laid off and cut back to four-day and three-day weeks because of declining business levels, they probably would not be so hasty in leaving their jobs over trivial grievances. One group in Detroit actually left their machines the other day because they "could not stand the cockroaches."

As long as automobile production holds to peak levels and sales cling to near-record highs, workers imagine they are embarrassing managements by walkouts. When the market subsides—and there is not too much optimism around Detroit over prospects for the second half of the year—then the strikers and protesters will wish they had earned their $1.70 an hour and up while they had the chance. The nationwide Ford tieup only speeds the day when economic pressures will force layoffs and shorter hours in the auto industry generally.

Jobbing shops in the gray iron field continue to find slim pickings, and are facing mounting competition. Price shading on gray iron and malleable castings for productive parts is general, while plants furnishing larger castings such as body dies, machinery bases and the like continue to scrape for orders. Tool and die sources report new passenger car model programs in prospect are insignificant. Work on the new Buick Special body is out of the way and the job is slated for production next month. Studebaker has some die work in process for revised models, and Nash reportedly is placing some business for an entirely new small design. Later in the year General Motors may have a program under way for new bodies for 1950 Buick, Cadillac and Oldsmobile. That is about it at the moment.

* * *

HEART of the new Packard Ultramatic transmission is a slick aluminum sand casting job for the four elements of the torque converter—pump, first turbine, reactor element and second turbine. The intricately bladed elements must be cast to precision dimensions and require superior finish to minimize oil turbulence. They are cast in sand by Aluminum Co. of America at its Cleveland plant, although there is talk of the job being transferred to Alcoa at Detroit when production of the transmission moves up closer to the projected 40 an hour. At present, assemblies are only four or five an hour, and the device is offered only on Packard Custom models which retail for better than $3500. Eventually the smaller Packards will have the transmission as a $225 option.

The Ultramatic goes one step beyond any automatic transmission yet developed for passenger cars, in that at cruising speeds the torque converter is locked out through the action of a governor controlling a mechanical clutch. In this way, the car is in direct drive and no slippage is experienced through the converter, with its resultant loss of gasoline economy.

In some respects, the unit is similar to the Buick Dynaflow, the latter having five elements in its torque converter. Originally these were cast in aluminum in plaster molds at the Bedford foundry of Allison Division.

(*Concluded on page* 157)

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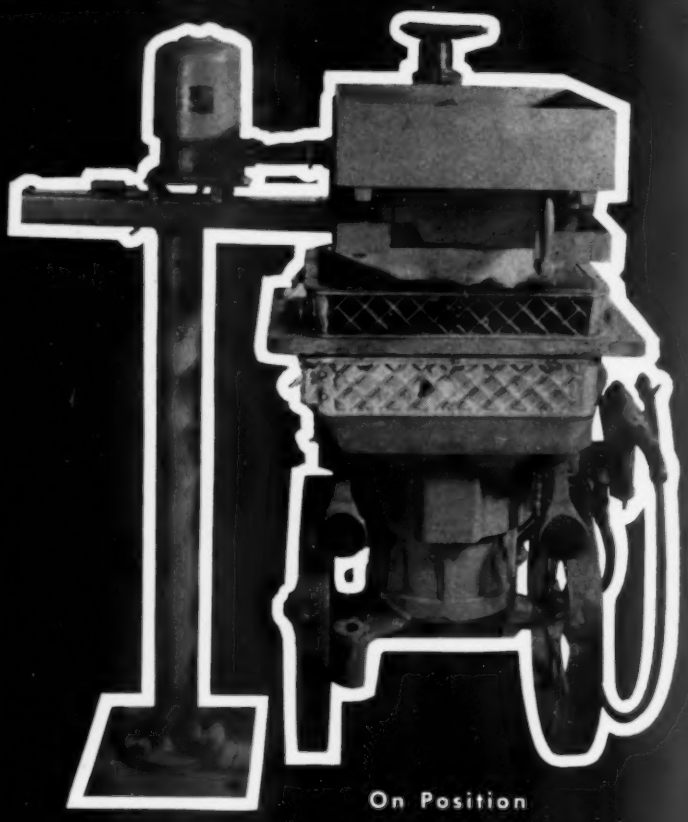
Model illustrated single channel **$365**

Standard double **$385**



On Position

Roller Riddle Corporation has developed the machine illustrated in an effort to find an answer to what has been a back-breaking foundry operation for years. This is it. It is a proven machine operating without mechanical failure in an outstanding foundry for over 3,000 hours.

★ In a matter of seconds sand is riddled onto the entire surface of the pattern plate easily and evenly. A special designed ¼ h.p. motor, combined with a limit switch, automatically activates the riddle basket oscillating 900 times per minute.

A 65 lb. sand capacity and a 31" travel of the riddle on the channel make the machines highly flexible. Sealed roller bearings throughout—no lubrication necessary. Shaft, tube rubber cased, keeps motor free of sand or dirt.

Write today for new catalog.

ROLLER RIDDLE CORP.

POST OFFICE BOX 178
PORT HURON, MICHIGAN

(*Concluded from page 154*)

but it is understood a switch has been made successfully to sand molds. General Motors transmission experts are working on a new design which will probably incorporate the principles of the Packard arrangement, although perhaps using a different means for accomplishing the same thing—eliminating torque converter slippage at higher speeds.

This month Lincoln is expected to announce availability of the General Motors Hydra-Matic drive on its models and Kaiser-Frazer also is reported to have test cars running equipped with Hydra-Matic. This type of transmission, pioneered by Olds and Cadillac and later adopted by Pontiac, likely will be superseded by a different version within the next two to three years.

Automotive engineers and metallurgists are keeping an intent eye on progress of the new ductile or nodulized cast irons for possible applications in their field. They recognize the many important advantages offered from the standpoint of strength and other physical properties, but are inclined to balk at the higher cost involved. Ford has been particularly close to the development for some time. A General Motors metallurgist said about the only application he could see was as a replacement for the corporation's own Arma-steel, and that would hardly be a good bet.

Educational Group Elects Officers

At the recent annual meeting of the Foundry Educational Foundation, the following officers were elected: Chairman of the board, Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, O.; president, Stowell Wasson, manager, National Malleable & Steel Castings Co., Chicago; vice president, B. D. Claffey, president, Acme Aluminum Alloys Inc., Dayton, O.; secretary-treasurer, Charles A. Barnett, president, Foundry Equipment Co., Cleveland. George K. Dreher continues as executive director of the foundation.

Trustees representing founding members include:

Malleable Founders' Society—Anthony Haswell, president, Dayton Malleable Iron Co., Dayton, O.; Richard W. Crannell, vice president, Lehigh Foundries Inc., Easton, Pa.

Gray Iron Founders' Society—John M. Price, president, Ferro Machine & Foundry Co., Cleveland, and Peter E. Rentschler.

American Foundrymen's Society—Stowell Wasson, manager, National Malleable & Steel Castings Co., Chicago; Fred G. Sefing, research metallurgist, International Nickel Co., New York.

Foundry Equipment Manufacturers Association—Claude B. Schneible, president, Claude B. Schneible Co., Detroit, and Charles A. Barnett.

Non-Ferrous Founders' Society—George B. Hazen, vice president and secretary, Brass Foundry Co., Peoria, Ill.; W. B. Wilkins, president, American Manganese Bronze Co., Philadelphia.

Steel Founders' Society of America—T. F. Dorsey, vice president, Fort Pitt Steel Casting Division, Pittsburgh Steel Foundry Corp., McKeesport, Pa.; Homer Tielke, vice president and general manager, Crucible Steel Casting Co., Cleveland.

Trustees at large—J. H. Smith, general manager, Central Foundry Division, General Motors Corp., Saginaw, Mich.; B. D. Claffey, president, Acme Aluminum Alloys Inc., Dayton; C. R. Culling, president, Carondelet Foundry Co., St. Louis; Brinton Welser, vice president, Chain Belt Co., Milwaukee; J. T. MacKenzie, technical director, American Cast Iron Pipe Co., Birmingham; G. J. Behrendt, managing director, Eastern Malleable Iron Co., Naugatuck, Conn.; A. W. Gregg, executive engineer, Whiting Corp., Harvey, Ill.

Book Review

Plastics Dictionary, Thomas A. Dickinson, 312 pages, published by Pitman Publishing Corp., New York.

Purpose of this dictionary is to provide both the expert and the layman with understandable definitions of terms generally used with reference to plastics. To supplement the definitions, various tables and charts are presented in alphabetical order, providing practical data on catalysts, chemical elements, fillers, pigments, plasticizers, solvents and other items that are intended to make the book an especially useful tool for the daily work of plastics technicians.

OBITUARY

MARTIN Rintz, 65, superintendent, Continental Foundry & Machine Co., East Chicago, died suddenly in his office Apr. 7. Mr. Rintz, a native of Philadelphia, entered the Cramp Shipyard there in 1898, as a patternmaking apprentice. He spent a year with Baldwin Locomotive Works, Philadelphia, and a year with Goss Printing Press Co., Chicago, and joined American Steel Foundries, Chicago, at its Indiana Harbor Works in 1908, serving as shop foreman and later as foundry foreman. In 1928 he was appointed general foreman at Continental Foundry & Machine Co., where he became superintendent in 1936. Mr. Rintz had long been active in the American Foundrymen's Society, and was a member of the executive committee of the Pattern Division and a director of its Chicago Chapter at the time of his death.

* * *

John H. Birdsong, 68, consulting metallurgist Buffalo Testing Laboratory, Buffalo, died there Apr. 7. Mr. Birsong was graduated from North Carolina State College and was associated with the Chicago plant of National Malleable & Steel Casting Co., Cleveland, for many years. He joined Pratt & Letchworth Co. Inc., Buffalo, in 1927 and became consulting metallurgist at Buffalo Testing Laboratory in 1932. He was a past chairman and for 12 years executive secretary, American Society for Metals.

* * *

Lester H. Pillion, 53, sales manager, Precision Castings Co., New York and Syracuse, N. Y., died May 2, at his home in New York. A native of Brooklyn, Mr. Pillion was associated with Doehler Die Casting Co., New York, from 1913 until its merger in 1945 with W. B. Jarvis Co., Grand Rapids, Mich., at which time he was vice chairman of the board of directors. Following a brief period as vice president and a director of Doehler-Jarvis Corp., he resigned.

* * *

John M. Kinsley, 73, former owner, Kinsley Foundry, Indianapolis, died May 4, at his home there. Mr. Kinsley was born in Muncie, Ind., and operated a foundry at Rushville, Ind., for 3 years. He went to Indianapolis in 1920 and founded the Kinsley Foundry which he operated for 25 years, retiring 4 years ago.

* * *

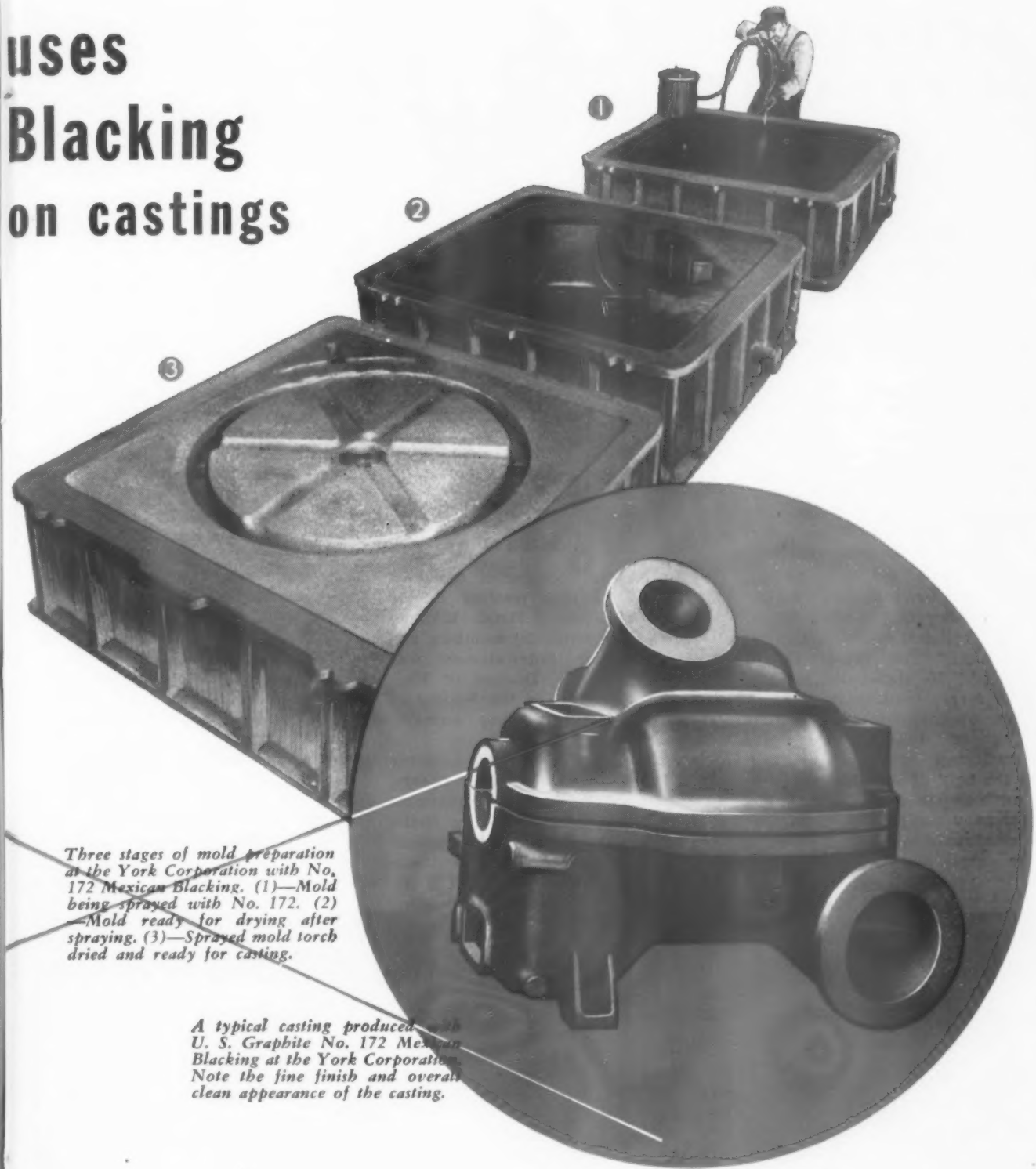
Zar T. Crittenden, 54, chief metallurgist, Pontiac Motor Division, General Motors Corp., Pontiac, Mich., died Mar. 25.

* * *

W. J. Spensley, for 53 years associated with Adams Co., Dubuque, Iowa, died Mar. 6.

York Corporation
No. 172 Mexican
for finer finish
The York Corporation, manufacturer of refrigeration and air conditioning units, and operator of large iron foundries, is a regular user of No. 172 Mexican Blacking to produce castings with a *better finish and reduce foundry production costs.* No. 172 is a high quality wet blacking, containing a binder, that can easily be applied to cores and dry sand molds with spray, brush, or swab. It permits the sand to peel freely, leaving a smooth-surfaced casting *that requires minimum cleaning.* No. 172 Mexican Blacking is recommended for medium, extra large and pressure castings weighing 1 to 25 tons. No. 172 is also an excellent core coating. Only water is required to prepare for use. Other Mexican Graphite products include Cordip —for dipping or spraying dry or green sand cores— and Mexacote—for cores and molds in light and medium production casting where extra resistance to high temperature metal is demanded.
THE UNITED STATES GRAPHITE COMPANY

uses Blacking on castings



Three stages of mold preparation at the York Corporation with No. 172 Mexican Blacking. (1)—Mold being sprayed with No. 172. (2)—Mold ready for drying after spraying. (3)—Sprayed mold torch dried and ready for casting.

A typical casting produced with U. S. Graphite No. 172 Mexican Blacking at the York Corporation. Note the fine finish and overall clean appearance of the casting.

No. 172 Mexican Blacking

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

ACTIVITIES OF FOUNDRY *Groups*

Washington

MARCH meeting of Washington Chapter of the AFS opened with reports on the pattern apprentice contest by Glen Wickund, and on the molder apprentice contest by Bill Gibb.

William B. Ziegelmueller, vice president and general manager, Electric Steel Castings Co., Indianapolis, gave a coffee talk on "Labor Aiding Devices for the Small Foundry." His talk was illustrated with slides, showing what has been done in his plant to increase efficiency of productive labor and to improve working conditions and casting quality.

Dr. Alexander Finlayson, Pacific Car & Foundry Co., Renton, Wash., was the technical speaker and his subject was "The Diesel Engine Crankshaft." He stated that replacement of forged crankshafts by castings was accomplished only by breaking down and disproving prejudicial and traditional thinking in the field. With the help of slides he described the methods currently employed by his company for producing the cast iron crankshafts and discussed some of the unique engineering properties of the cast crankshaft.

Material used in the casting is basically steel with free graphite, a high-test gray iron running 65,000 to 70,000 psi tensile strength. It is melted in a basic electric arc furnace under close control. Final properties of the casting are determined by an inoculation in the ladle. A bottom-pour ladle is used in pouring the crankshafts, some of which required up to 4700 lb of metal.—*Harold R. Wolfer, Puget Sound Naval Shipyard.*

Michiana

MICHIANA Chapter of the AFS held its final meeting of the season at Elkhart Hotel, Elkhart, Ind., Apr. 5, with 120 members and guests present. Entertainment was provided by the "Doctors of Harmony," a quartet of the Society of Barbership Singing, and formerly national champions.

Officers elected for the coming year are: Chairman, V. S. Spears, American Wheelabrator & Equipment Corp., Mishawaka, Ind.; vice chairman, William Ferrel, Auto Specialties Co., St. Joseph, Mich., and secretary-treasurer, Paul Jordan, Dodge Mfg. Corp., Mishawaka.

Directors for three-year terms are: R. D. Craft, Allis-Chalmers Mfg. Co., LaPorte, Ind.; H. D. Hunt, Auto Specialties Co.; L. D. Reiff, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.; and C. H. Ker, Dalton Foundries Inc., Warsaw, Ind. For a two-year term: H. T. Lewis, Harbison-Walker Refractories Co., Chicago. For two-year terms: John Hager, Columbia Castings Co., South Bend, Ind., and Francis Honer, Woodward Pattern Works Inc., South Bend. K. A. Nelson, Chicago Hardware Foundry Co., Elkhart, and past chairman, will automatically serve as a director for one year.

Following the business session, four separate roundtable discussions were held: Patternmaking, Russell Hoffman, Elkhart Pattern Work, Elkhart, chairman; nonferrous metals, James Strom, Strom Brass Foundry, Elkhart, chairman; steel and malleable iron, Harry Hunt, Auto Specialties Co., St. Joseph, chairman, and gray iron, Andy Peterson, Oliver Corp., South Bend, chairman.

The chapter's annual picnic is

(*Continued on page* 162)

WASHINGTON: View of the speakers' table at the March meeting of Washington Chapter of the AFS is shown above. Left to right are: Dr. Alexander Finlayson, Pacific Car & Foundry Co., Renton, Wash., principal speaker; William Ziegelmueller, Electric Steel Castings Co., Indianapolis, coffee speaker; Edward D. Boyle, Puget Sound Naval Shipyard, Bremerton, Wash., chapter vice chairman, and Ed Durham, Los Angeles

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EASTERN NEW YORK Chapter of the AFS heard Clyde A. Sanders, vice president, American Colloid Co., Chicago, speak on "Care and Handling of Sand" at its March meeting

(*Continued from page* 160)

scheduled for late in the summer, and regular meetings will be resumed in October.—*S. F. Krzeszwski, American Wheelabrator & Equipment Corp.*

Wisconsin

SIX sectional meetings were features of the Apr. 8 meeting of Wisconsin Chapter of the AFS held at Schroeder Hotel, Milwaukee. During the business meeting, Robert C. Woodward, Bucyrus-Erie Co., Milwaukee, and president of the chapter, announced the election of the following officers and directors:

Robert C. Woodward, re-elected president; Walter W. Edens, Badger Brass & Aluminum Foundry Co., vice president; George E. Tisdale, Zenith Foundry Co., secretary, and Leon Decker, Allis-Chalmers Mfg. Co., treasurer. Charles Fuerst, Falk Corp., was elected a director to serve two years and Kenneth Geist, Allis-Chalmers Mfg. Co., Joseph Gutenkunst, Milwaukee Malleable & Grey Iron Works, and Frank Jacobs, Standard Brass Works—all of Milwaukee—were elected to serve three years.

After dinner the members had their choice of the following talks:

Gray Iron—"Foundry Facings," by Dr. J. A. Riddeehot, Frederic B. Stevens Inc., speaker, with Harold Sohner, International Harvester Co., as chairman.

Steel—"Importance of Sand Density in Steel Foundry Molds," by Clyde A. Sanders, American Colloid Co., with V. E. Ziemer, Maynard Electric Steel Castings Co., as chairman.

Malleable — "Cracks in Ferrous Castings," by B. C. Yearley, National Malleable & Steel Castings Co., with Paul Anderson, International Harvester Co., as chairman.

Nonferrous — "Making Aluminum Matchplates in Plaster," by Kurt Miericke, U. S. Gypsum Co. His talk was supplemented by motion pictures. A. R. Tooman, Racine Aluminum & Brass Foundry Co., served as chairman.

The pattern group held a discussion reviewing the season's topics on patterns. Discussion leaders were the

(*Continued on page* 164)

WISCONSIN Chapter of the AFS met at Hotel Schroeder, Milwaukee, Mar. 11, to hear an address by DeWitt Emery, president, National Small Business Men's Association. In Fig. 1, left to right, are: Mr. Emery and R. C. Woodward, Bucyrus-Erie Co. Left to right in Fig. 2 are: Sid Henrichs, Delta Oil Co., and J. Luther, Universal Foundry Co.; Fig. 3, W. W. Edens and W. T. Pagel of Badger Brass & Aluminum Co.; Fig. 4, Ray Karns, Pickands Mather & Co., and Glen Bruce, J. M. Bruce Foundry Co., and Fig. 5, Marvin Knoller, Electro Refractories & Alloys Corp., J. Krueger, Grede Foundries Inc., and T. Meagher, Chicago Retort & Firebrick Co.

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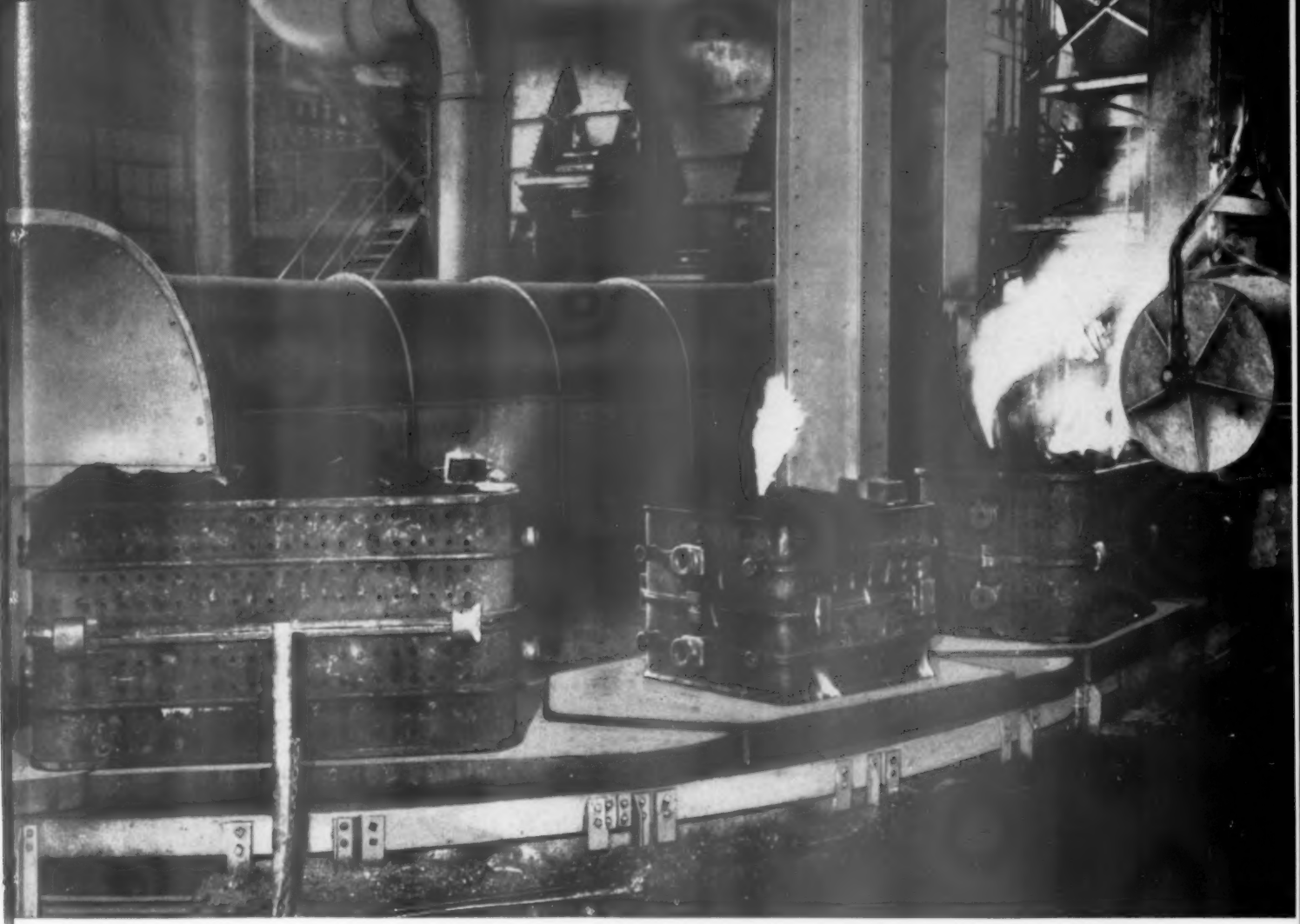

Its clover leaf shape saves floor space

If you have ever said "I wish I had room to get more special, short run production out of this plant" (and most foundrymen have) – you'll be interested in the Bartlett-Snow mold conveyor pictured above. It handles 5 sizes of flasks, for castings ranging from 50 to 650 lbs. each . . . and has permitted production of short run work to be more than doubled.

This mold conveyor loops back and forth in tight curls like a clover leaf or pretzel, and thus provides needed cooling time between pouring and shakeout, in minimum floor space. The conveyor is 468 ft. long and consists of 72 cars of Bartlett-Snow's special design, with 6'6" long over-lapping cast iron tops. The conveyor operates intermittently to accommodate the different time cycles of making copes and drags, and the setting of cores, in large, medium and small size flasks.

The entire cooling section of the conveyor is covered with a Bartlett-Snow smoke hood, and a sidewall dust hood catches the dust and smoke at the shakeout, preventing contamination of the foundry air.

Whether yours is a short run jobbing, or long run repetitive production foundry – let the Bartlett-Snow engineers with their long and intimate familiarity with the needs of practical day to day operation study and analyze your present operation –and suggest ways of making better use of your present floor area and more efficient methods of handling sand, and molds and castings. The C. O. Bartlett & Snow Company, 6200 Harvard Ave., Cleveland 5, Ohio. Engineering representatives in New York, Baltimore, Detroit and Chicago.

BARTLETT-SNOW
CLEVELAND 5, OHIO

DESIGNING AND CONTRACTING ENGINEERS

For the Foundry Industry

SAND, MOLD AND CASTINGS HANDLING EQUIPMENT

(*Continued from page* 162)
group's program committee with Albert Huebner, Allis-Chalmers Mfg. Co., as chairman.

Technical group heard Theodore Mordaunt, General Refractories Co., talk on "Super-Duty Refractories for Foundry Use," with Adolph J. Popovich, Allis-Chalmers Mfg. Co., serving as chairman.—*John E. Hubel.*

Twin City

MORE than 100 members and guests of Twin City Chapter of the AFS met at the Covered Wagon, Minneapolis, on Apr. 7, to hear V. J. Sedlon, president of the Master Pattern Co., Cleveland, speak on "Pattern Making."

While no major change in patternmaking is contemplated for patterns primarily designed for small orders, Mr. Sedlon pointed out that when large production quantities of castings are required from a single pattern, more modern methods of patternmaking come into play. He stressed the need for absolute cooperation between foundrymen and patternmakers and described the basic instructions which must be given by foundrymen to patternmakers before the latter can be expected to produce satisfactory equipment. Reconsideration of these fundamental instructions by the patternmaker often results in more accurate and less costly equipment to the foundry.

Mr. Sedlon also reviewed new types of materials used for patterns which include electroforming of a copper "skin" on a lead-base shell. Although patterns made by this method usually are quite heavy to handle, the reproduction of detail is excellent when making multiple equipment from a master pattern. A series of excellent color slides including pictures of the Mercast process, lost wax process, resin patterns and high production pattern machine equipment were shown.—*O. J. Myers, Werner G. Smith Co.*

TWIN CITY Chapter of the AFS met Mar. 3 at the Covered Wagon, Minneapolis, to hear R. A. Quadt, Federated Metals Division, American Smelting & Refining Corp., New York, discuss "Producing Quality Aluminum Castings"

Chesapeake

MARCH meeting of Chesapeake Chapter of the AFS featured a talk by Dr. Richard A. Flinn, American Brake Shoe Co., Mahwah, N. J., on "Heat Treatment of Gray Iron." Dr. Flinn emphasized that the metallographic structure is the primary guide to the properties of the metal. This structure, originally determined during the solidification and cooling of the casting, can be altered by annealing, hardening or stress relief heat treatments.

Softening massive carbides requires at least 1600° F whereas martensite and fine carbide may be softened at 1200-1300° F. The speaker described the use of the Jominy end-quench test for evaluating the hardenability of various grades of cast iron and showed slides of hardenability charts constructed from resulting data. Examples were cited of castings, such as the chilled car wheel, where localized chilling and heat treatments were used to produce varied but optimum structures in different parts of the same casting. —*Jack H. Schaum, National Bureau of Standards.*

Tennessee

TENNESSEE Chapter of the AFS met at Hotel Patten, Chattanooga, Tenn., Mar. 18. George K. Dreher, executive director, Foundry Educational Foundation, spoke briefly, stating that of the 15 million tons of castings made yearly, 150,000 tons are wasted as defective. At 10 cents per pound this amounts to $30 million. He said that through education and improvement, this loss could be reduced.

Prof. E. C. Wright, head of the metallurgy department, University of Alabama, also spoke briefly on the subject of interesting young men in taking foundry courses. He suggested that scholarships of $500 with summertime jobs in foundries would be attractive to high school boys. With such a plan the industry could show those boys the opportunities existing in foundry work.

Principal speaker of the evening was C. O. Bartlett, vice president and director of sales, C. O. Bartlett & Snow Co., Cleveland. He spoke on

(*Continued on page* 166)

JOY AXIVANE* FANS

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The quieter operation, lighter, more compact design, lower power consumption and unmatched efficiency of JOY Axivane Fans are *real* advantages! What's more, their vaneaxial design and in-line construction permit mounting right in the air duct, making installation simple and saving greatly on time and cost. These features—plus the extreme flexibility of operating range made possible by adjustable blades, *exclusive* with JOY Fans—mean better, more dependable and lower-cost ventilation, no matter what your conditions are.

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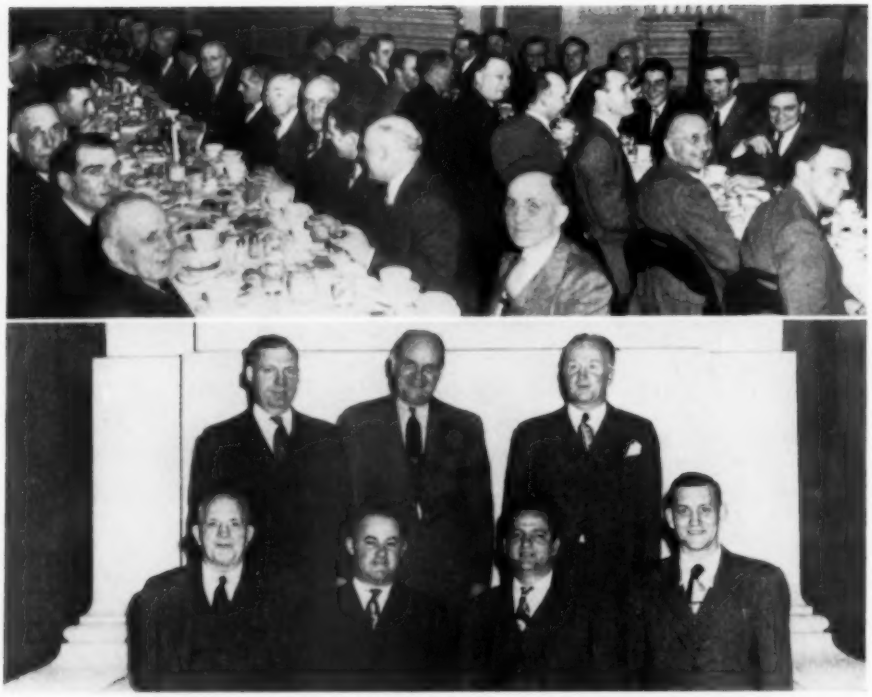


PHILADELPHIA: Views of the Mar. 11 meeting of Philadelphia Chapter of the AFS held at Franklin Institute, Philadelphia. At top is the dinner group. At bottom, left to right, front row, are: George H. Bradshaw, director; C. L. Lane, chairman; W. A. Morley, vice chairman, and E. C. Troy. Back row: C. B. Jenni, W. B. Wilkins, and J. L. Furey, directors

(*Continued from page* 164)

"Foundry Mechanization," and showed slides of various installations of materials handling equipment.

Mr. Bartlett stated that the planning of mechanized setups requires that engineers spend plenty of time to study the situation completely. He warned foundrymen against insisting on a hurry-up job only to find themselves in a worse bottleneck situation than before.

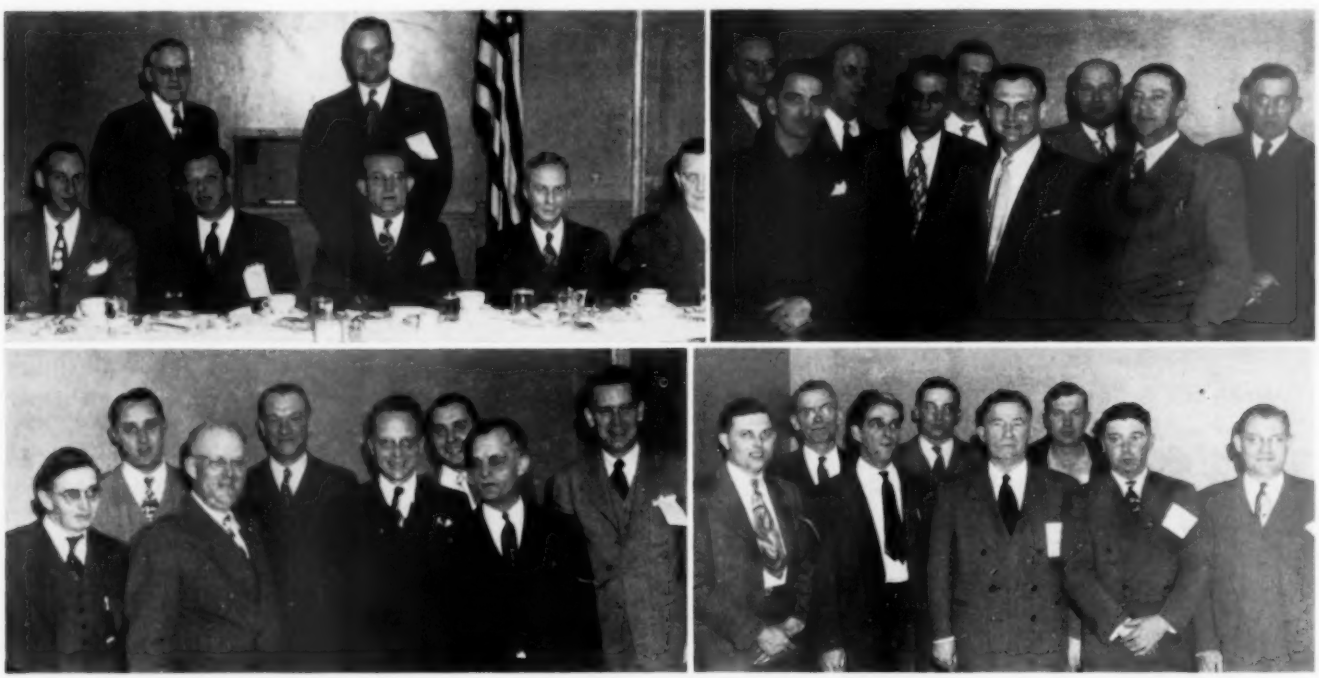
In discussing screens for cooling sand, Mr. Bartlett suggested that large size and capacity screens are better for the job—they eliminate heat faster and will pay for themselves in the long run. Screens with spiders and shafts in them cause serious trouble by materials catching on them inside the framework. —*Carl A. Fischer Jr., Fischer Supply Co.*

Philadelphia

A PANEL discussion on "Care of Foundry Equipment" featured the Apr. 8 meeting of Philadelphia Chapter of the AFS at the Engineers Club, Philadelphia. Approximately 165 members and guests were present. Walter S. Giele, foundry consultant, Lebanon, Pa., was technical chairman.

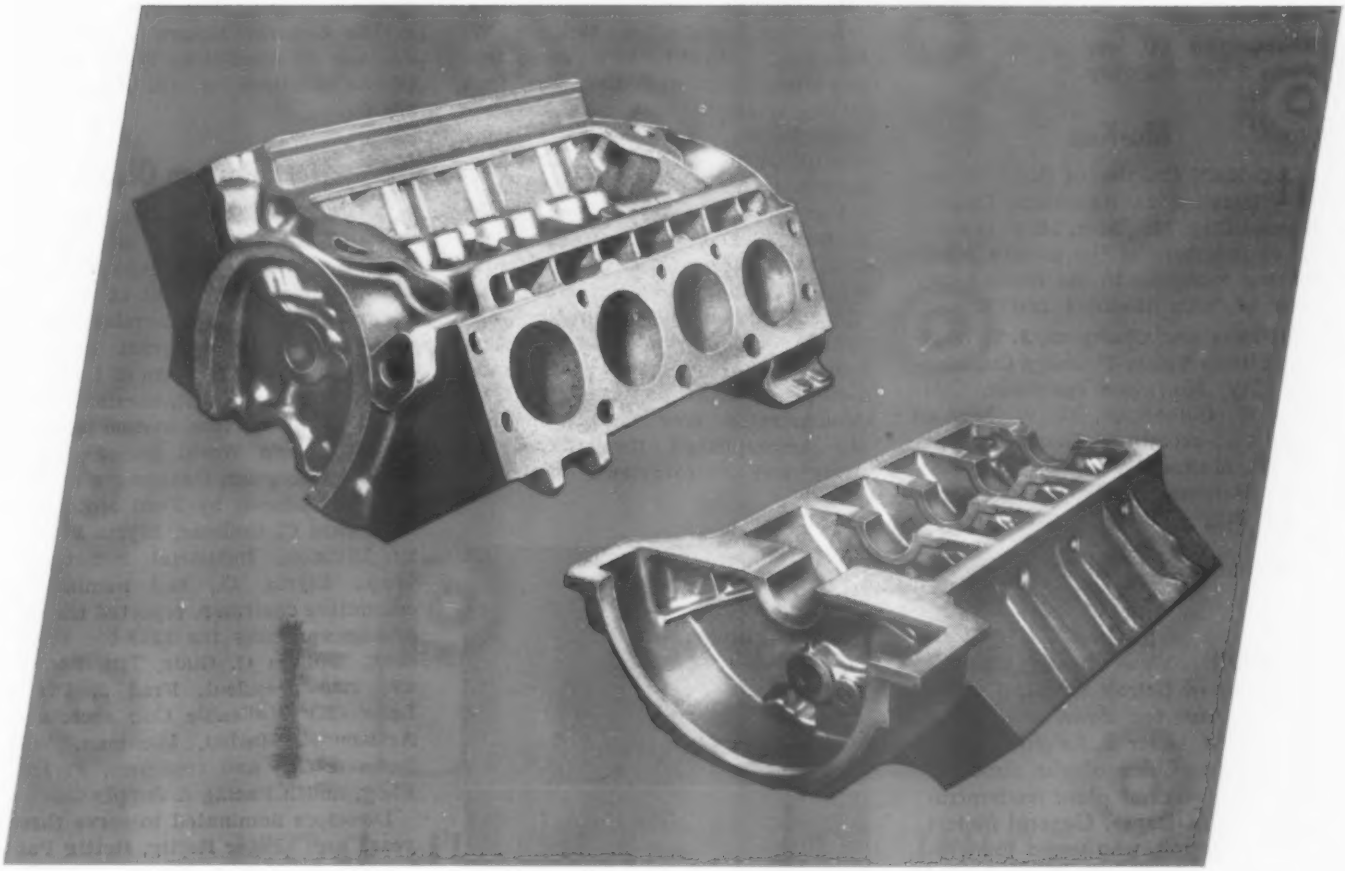
Three men discussed the products of their respective firms. G. B. Comfort, Schramm Inc., West Chester, Pa., spoke on "Compressed Air and Air Compressors;" R. Shire, Tabor Co., Philadelphia, "Molding Ma-

(*Continued on page* 168)



TENNESSEE Chapter of the AFS met Mar. 18 at Hotel Patten, Chattanooga, Tenn. Speakers' table is shown at upper left. Front row, left to right, are: Karl Landgrebe, Wheland Co., Chattanooga; C. O. Bartlett, C. O. Bartlett & Snow Co., Cleveland, principal speaker; G. Frank Anderson, Chattanooga Implement & Mfg. Co., Chattanooga; Prof. E. C. White, University of Alabama, and H. C. Orr, C. O. Bartlett & Snow Co. Back row: Harry Griscom, Wheland Co., and George K. Dreher, Foundry Educational Foundation, Cleveland. At upper right is a group from U. S. Pipe & Foundry Co.; at lower left a group from Ross-Meehan Foundries Inc., and at lower right a group from Wheland Co., all of Chattanooga

Another Engineering Achievement by BUFFALO PATTERN WORKS



These New Motor Blocks Are Made With High Accuracy Buffalo Pattern Works Equipment

Buffalo Pattern Works recently completed several duplicate sets of machined, high-speed production equipment to produce this late model cylinder block with a low scrap ratio and low machining cost. This brand of skill has been the hallmark of Buffalo Pattern Works for over 56 years.

We invite you to consult us regarding your production pattern requirements.

Since 1893

BUFFALO PATTERN WORKS

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(*Continued from page* 166)

chines," and A. L. Gardner, Pangborn Corp., Hagerstown, Md., "Cleaning Devices and Dust Control Equipment."

Increased life of the machines, reduced maintenance costs and improved operations were covered in the talks.—*A. J. Saute, American Engineering Co. and J. L. Furey, Swan Finch Oil Corp.*

Mo-Kan

MO-KAN Chapter of the AFS was installed at Rockhurst College, Kansas City, Mo., Mar. 16. It is made up of members of the society representing foundries in the Kansas City area of both Missouri and Kansas.

Officers are: Chairman, J. T. Westwood, Blue Valley Foundry Co., Kansas City, Mo.; vice chairman, Clarence W. Culbertson, M. W. Warren Coke Co.; secretary, Charles W. Myers Jr., Morton-Myers Co., and treasurer, Herman P. Scwickrath, Prier Brass Mfg. Co., all of Kansas City, Mo.

Directors are: E. C. Austin Jr., National Aluminum & Brass Foundry Inc., and Milton B. Gold, Gold Foundry & Machine Works, both of Independence, Mo.; Alan G. Linley, Locomotive Finished Material Co., Atchison, Kans.; W. Leslie Neville, Neville Foundry Co., North Kansas City, Mo.; and E. C. Sooy, Kansas City Hay Press Co., Kansas City, Mo.

At the installation, William W. Maloney, national AFS secretary-treasurer, presented the cast iron rattle, symbolic of a new chapterhood, to Mr. Westwood, and spoke briefly on the advantages of membership in an active AFS chapter.

For the technical session, Elmer E. Braun and David T. Martin, General Motors Corp., Danville, Ill., presented a talk and demonstration on "Short Cuts in the Coreroom." Mr. Braun pointed out details of operation, poor equipment setups and methods of handling, as Mr. Martin demonstrated how better methods are accomplished through motion study and improvements of equipment. Main purpose of the demonstration was to show how inexpensive, simple changes can result in increased production with reduction of operator fatigue.

The presentation was concluded with the showing of a movie, "Better Methods," depicting how better methods engineering was employed in the General Motors foundries.—*Thomas F. Shadwick, Witte Engine Works Division of Oil Well Supply Co.*

DETROIT: Views of the Mar. 17 meeting of Detroit Chapter of the AFS. From top down are: Lester B. Knight, Lester B. Knight & Associates Inc., Chicago, who discussed the economics of plant modernization; L. A. Danse, General Motors Corp., Detroit, who urged foundrymen to exert greater effort toward making foundries better places in which to work and improving castings quality; R. J. Wilcox, Michigan Steel Casting Co., Detroit, and chapter program chairman, (left) congratulates Tom Butler, Ford Motor Co., Dearborn, Mich., for his discussion of foundry maintenance problems, and at bottom, the speakers' table. Left to right are: Claude B. Schneible, Claude B. Schneible Co., Detroit; Mr. Knight; Mr. Danse; Mr. Butler; and A. W. Stolzenburg, Aluminum Co. of America, Detroit, and chapter chairman. Photos by L. G. Whitehead, Claude B. Schneible Co.

Northeastern Ohio

NORTHEASTERN Ohio Chapter of the AFS had one of the largest turnouts for a regular meeting with over 260 present at the Apr. 14 gathering at the Cleveland Club, Cleveland. The program included announcement of winners of the local apprenticeship contest, nomination of officers and directors, motion pictures of last year's World Series, and a technical program featuring a motion picture produced by Ford Motor Co.

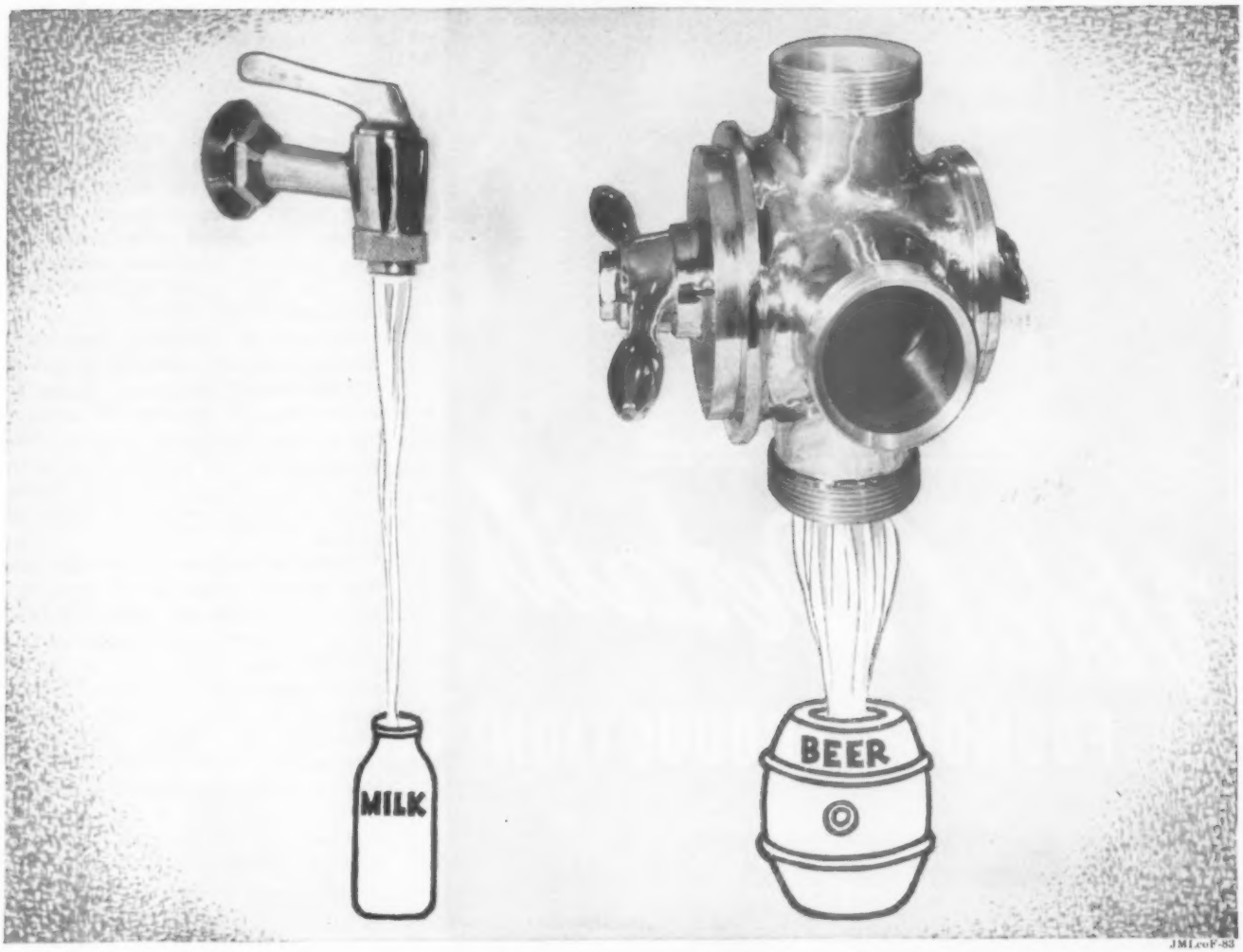
Howard C. Gollmar, Elyria Foundry Division, Industrial Brownhoist Corp., Elyria, O., and nominating committee chairman, reported the following nominees for 1949-50: President, William G. Gude, THE FOUNDRY; vice president, Fred J. Pfarr, Lake City Malleable Co.; secretary, Arthur F. Harlan, Hickman, Williams & Co., and treasurer, F. Ray Fleig, Smith Facing & Supply Co.

Directors nominated to serve three years are: Peter Rettig, Rettig Pattern Co.; Henry Macler, Sterling Foundry Co., Wellington, O.; Charles F. Seelbach Jr., Forest City Foundries Co.; T. E. Heyl, Federal Foundry Supply Co., and Richard L. Pope, Electro Alloys Division, American Brake Shoe Co., Elyria, O. H. R. Doswell, Permold Co., Medina, O., was nominated director to serve the unexpired term of E. G. Fahlman, resigned.

Peter Rettig announced the winners in the apprentice patternmakers' local contest and presented checks awarded by Associated Industries of Cleveland. First prize was won by Donald A. Siebert, Royal Pattern Works; second prize, Edward J. Prenata, Cleveland Standard Pattern Works, and third prize, Michael Simenic, Aluminum Co. of America.

Winners in the several apprentice molding contests were announced by Walter Seelbach, Superior Foundry Inc., who presented the checks awarded by Associated Industries. First prize in the steel division was given to N. Kraynik, West Steel Casting Co., and second prize to F.

(*Continued on page* 170)



JMI.coF-53

MOO JUICE to MALT JUICE!

The small valve is for the dairy industry; the large one for the brewery field. Both are cast of Federated Nickel Silver . . . for very good reason.

Since 1912 the Specialty Brass Company, Kenosha, Wisconsin, has been making castings for dairy equipment. Then, and even more so now, the demands of this food industry forbid the use of castings with even the slightest blemish. Brewery equipment must likewise be virtually perfect.

To produce such castings consistently . . . and to be famous for it . . . Specialty Brass uses the best in methods, and the *best in materials.* Specialty uses Federated Nickel Silver exclusively.

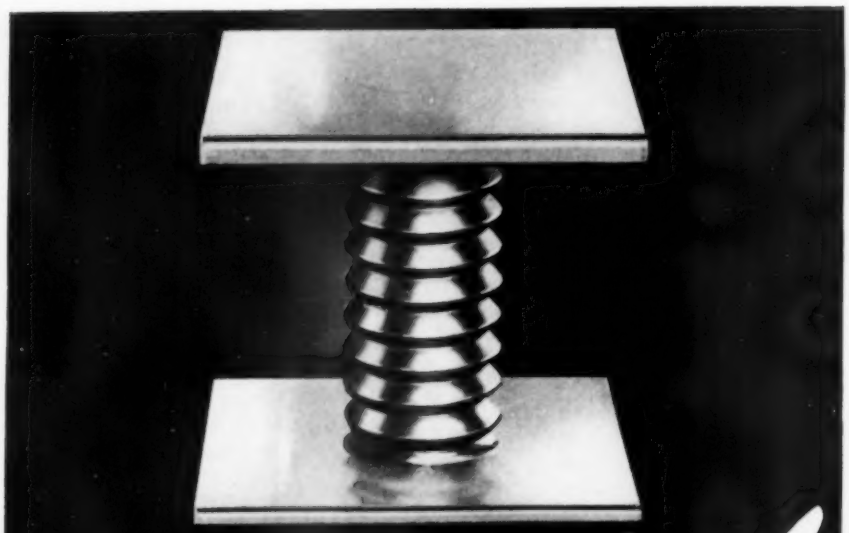
Nickel silver alloys are particularly suited for use where high corrosion resistance and silvery white color are important. Federated metallurgists can tell you exactly what alloy fits your need. They are ready and willing to help out in your foundry, too, should casting problems arise.

For nickel silvers; brasses and bronzes; aluminum and magnesium alloys; solders; babbitts; fabricated lead products; for any non-ferrous metals, see Federated first.

Federated first in the non-ferrous field FMD

Federated METALS DIVISION

AMERICAN SMELTING AND REFINING COMPANY, 120 BROADWAY, NEW YORK 5, N. Y.



Vital Details
OF FOUNDRY PRODUCTION!

Compared to the castings in which they are used, chaplets and chills often appear to be trifles. Yet, to foundrymen who are striving for constant improvement in casting quality, they are details of vital importance.

Through years of close association and co-operation with the Foundry Industry, the makers of Milwaukee Chaplets have helped to develop several distinct types of chaplets and chills which have contributed to improved casting production.

The Milwaukee Double Head, Thread Stem Chaplet, pictured above, represents but one of the advancements in chaplet design represented in the *Milwaukee Line* of "Vital Details". It includes Standard Radius Chills, Schmitz Chaplets, Patented Adjustable Radius Chills, Special Chaplets and Related Specialties. Write for Samples and Prices.

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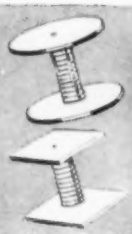


MILWAUKEE CHAPLET

(*Continued from page* 168)

Albaise of the same firm. First prize winner in the gray iron division was Chester Konopinski; second prize, John Valichnac, and third prize, Thomas Conrad—all serving apprenticeships at Fulton Foundry & Machine Co. In the nonferrous division first prize was awarded to Elmer Turk, Wellman Bronze & Aluminum Co., second prize, Donald Inman, Western Aluminum Matchplate Co., and third prize, Andrew Gerda, Cleveland Trade School.

William W. Maloney, secretary-treasurer of the AFS, spoke briefly on the annual convention of the society. He also directed attention to the various research projects being sponsored by the society and stated that from time to time progress reports would be issued on those activities.

Technical program featured a motion picture prepared by Ford Motor Co., Dearborn, Mich., entitled "Iron Ore to Motive Power," with a running commentary by Tom Butler and a summation by Harry Gravlin, both of the Ford company. In his comments, Mr. Butler pointed out that in the recent revamping of the Ford foundry department, stress was directed primarily to betterment of working conditions and elimination of worker fatigue.

The motion picture showed various operations in the blast furnace, coremaking, molding and technical control departments. Metal for gray iron castings is a combination of blast furnace metal and cupola metal which is mixed in a gas-fired 400-ton mixer, and then distributed to electric and air furnaces for refining and bringing to temperature prior to transfer to the various pouring stations.

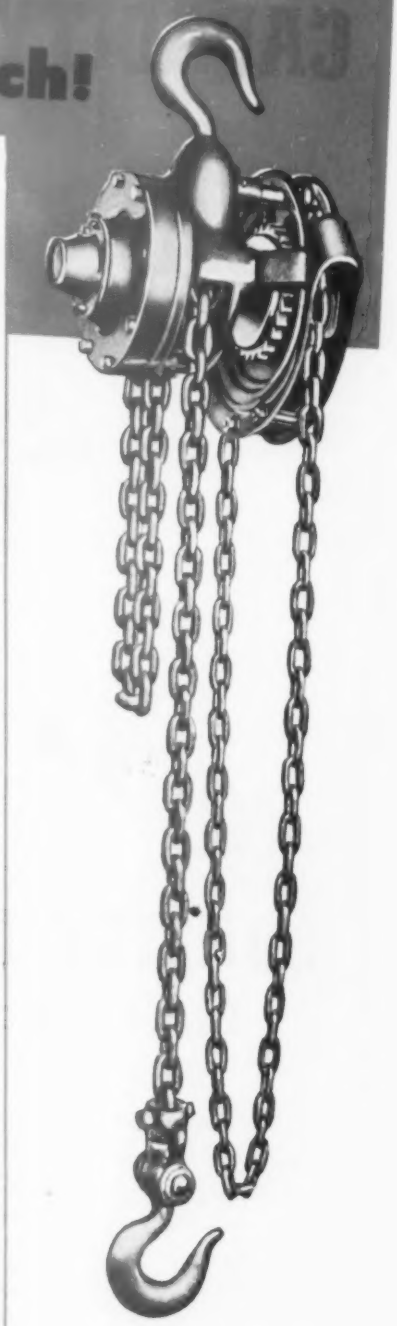
Meeting closed with presentation of a motion picture on the 1948 World Series baseball games between the Cleveland Indians and the Boston Braves.—*Edwin Bremer.*

Northwestern Pennsylvania

PRINCIPAL speaker at the Mar. 28 meeting of Northwestern Pennsylvania Chapter of the AFS, held at the Moose Club, Erie, Pa., was Ralph L. Lee, public relations department, General Motors Corp., Detroit. Mr. Lee is an outstanding authority on employee relations and his talk, entitled "Production Rhythm," stressed the human element and how it is comparable to different materials. Although we have made great strides in seeking and finding the facts about materials,

(*Continued on page* 172)

this lightweight packs a heavy-duty punch!



David Round Auto-Bloc
lightweight, heavy-duty hoist

The Auto-Bloc gear mechanism is guaranteed for life!

On the scales, in over-all dimensions, ease of installation and handling . . . the David Round Auto-Bloc easily qualifies as a lightweight hoist.

But, measured by service yardsticks, the Auto-Bloc is a real heavyweight. It's built for the toughest, heavy-duty jobs. *And—the Auto-Bloc is the only hand hoist whose hoisting gears are guaranteed for life.*

★ ★ ★ ★

The Auto-Bloc's ability to combine light weight with heavy-duty strength is due solely to its simplified lifetime hoisting mechanism. This employs only two gears as contrasted to complicated multi-gear systems in other hoists. Substantial weight savings (20 to 35%) are logical results.

In the Auto-Bloc every heavy-duty working part is made of chrome manganese hardened steel. No light metals are used at any point. The Auto-Bloc is lightweight solely because of its simplified design. There is no skimping on steel.

If you take pride in fine equipment, ask your supplier about Auto-Blocs. Do it today! Remember, the Auto-Bloc is the only heavy-duty hoist which is lightweight because of simplified design rather than light construction.

HOW THE AUTO-BLOC WORKS!

Fig. 1

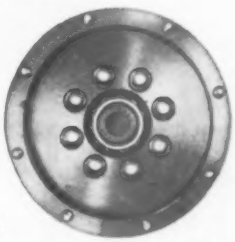


Fig. 2

Outstanding feature of the Auto-Bloc is its simplified lifetime hoisting mechanism. This employs only 2 gears. These are (Fig. 1) a cam-actuated floating inner gear and an outer gear to which the load sheave is rigidly connected. In the outer cover of the hoist (Fig. 2) are 8 hardened steel balls seated in cups. Each pull on the hand chain causes the cam shaft to revolve, actuating the floating inner gear which moves eccentrically over the inner circumference of the outer gear. Held in one position relatively by the 8 balls, the inner gear cannot rotate. It thus compels movement of the outer gear and load sheave. Gears are alloy cut, hardened and ground. They provide maximum strength with a larger number of teeth in mesh at all times than in any other hoist.

Since DR DAVID ROUND HOISTS & CRANES *1869*

Guaranteed for Life!

David Round & Son will replace free of charge any Auto-Bloc gears which fail in service (regardless of the age of the hoist) provided the hoist is operated in accordance with material handling manufacturers' standards.

ROUND

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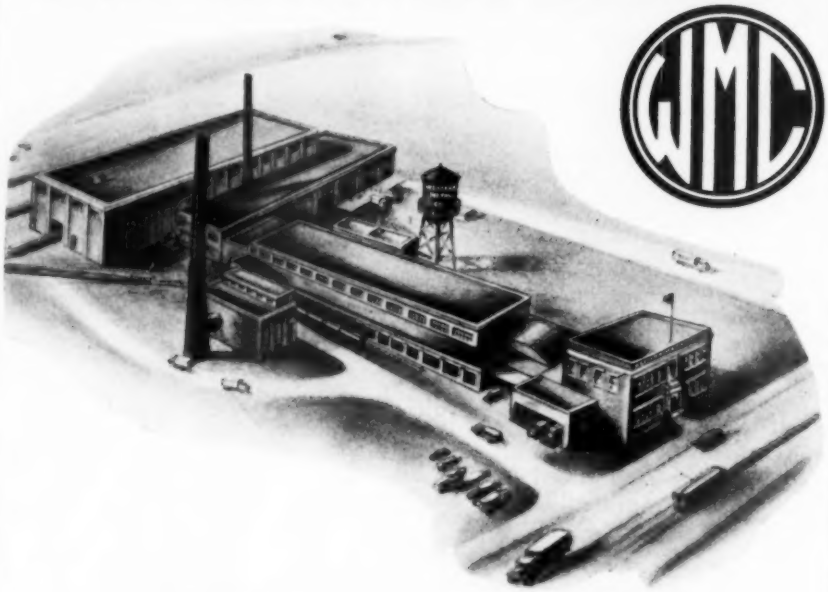
A-1963

CAPACITY TO SERVE!

WMC



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Here in one booklet is a complete summary of tables of standard specifications of nonferrous ingot metal alloys for all various modern industrial classifications. This bulletin will be of utmost value to you as will an acquaintance with a truly reliable ingot manufacturer, for the successful operation of your foundry.

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Smelters and Refiners of Brass and Aluminum Ingots

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(*Continued from page* 170)

we have failed to find a medium to measure the human element, and Mr. Lee urged that we make the most of the meager knowledge gained through practical experience.

Col. Kenneth M. Momeyer, who presented the coffee talk, discussed "Military History of Erie and Erie County," with the theme of military preparedness.

Principal speaker at the Apr. 25 meeting of Northwestern Pennsylvania Chapter of the AFS held at the Moose Club, Erie, Pa., was C. O. Bartlett, vice president and sales director, C. O. Bartlett & Snow Co., Cleveland. He emphasized the point that in mechanizing a foundry, plenty of room should be provided to permit efficient operation and maintenance.

Earl Strick, cleaning room superintendent of the Erie Malleable Iron Co., Erie, substituted for the coffee speaker and gave an interesting history of the foundry industry in Erie and Erie county.—*James J. Farina, American Sterilizer Co.*

Chicago

ANOTHER of its roundtable meetings was featured by Chicago Chapter of the AFS on Apr. 4. More than 200 members and guests attended the four group sessions held at the Chicago Bar Association with chapter president, Chester K. Faunt, works manager, Christensen & Olsen Foundry Co., Chicago, presiding at the dinner and business meeting and chapter vice president, W. D. McMillan, works metallurgist, McCormick Works, International Harvester Co., Chicago, supervising the group meetings.

Special guests included five British foundrymen who are members of a group visiting this country under the auspices of the Anglo-American Council on Productivity, sponsored by the Economic Co-operation Administration. The British guests were J. Jackson, technical director and assistant managing director, Jackson Elphick & Co., Lanarkshire; W. L. Hardy, foundry manager, Lake & Eliot, Essex; R. MacNab, foundry manager, Clyde Alloy Co., Scotland; E. Daybell, chief methods engineer, K. & L. Steelfounders, Hertfordshire; and T. H. Lamb, charge hand molder, County Durham.

The nonferrous and pattern groups collaborated in one roundtable to hear John B. Skelly, manager, Chicago Division, Hines Flask Co., discuss "Relationship between Good Patterns and Flask Equipment." Harry

(*Continued on page* 174)

A. P. Green
REFRACTORY PRODUCTS

SATANITE

Slag Resisting Mortar

Retards Joint Erosion in

- Malleable Iron Air Furnaces
- Ladles
- Electric Furnaces
- Cupolas
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Unretouched photo of a section from a malleable iron air furnace side wall showing protrusion of SATANITE joints after firebrick had worn back several inches.

SATANITE comes to you packed in 100-lb. moisture-proof multi-wall bags.

SATANITE has been developed by A. P. Green to extend the life of firebrick joints in all types of furnaces and ladles in which molten iron or steel is in contact with the brick and joint erosion is unusually severe. In such service, SATANITE retards erosion—joints actually protrude $\frac{1}{8}$ to $\frac{1}{4}$ inch beyond the surface of the brick after the brick have been worn back several inches.

In malleable air furnaces, where side walls and bottom are laid up with SATANITE, any part of them can be easily removed for patching or rebuilding. SATANITE'S long service life in joints gives additional protection to side wall and bottom brick.

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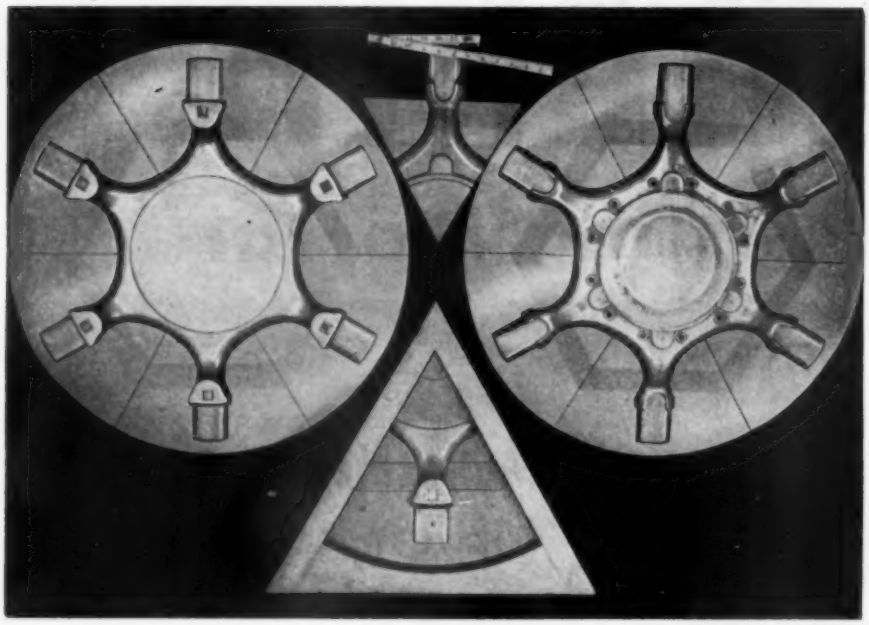

Cope and drag equipment for truck wheel, made from one spoke (1/6) of wheel.

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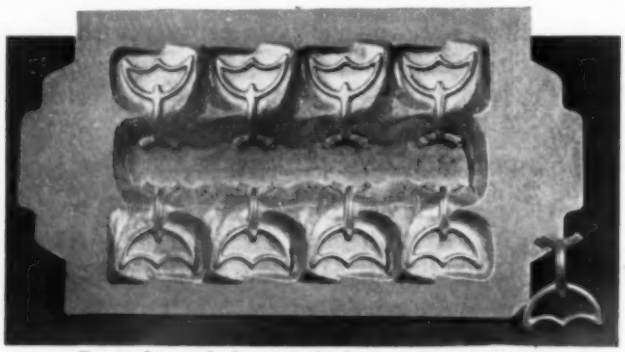


Typical matchplate made from master pattern

PLASTER PROCESS CASTINGS COMPANY

6922 Carnegie Avenue Cleveland 3, Ohio

Affiliate—Toledo Matchplate Co., 534 State St., Toledo 2, Ohio

Pressure-Cast MATCHPLATES COPE and DRAG PLATES

(*Continued from page* 172)

C. Swanson, vice president and manager, Arrow Pattern & Foundry Co., Chicago, was chairman.

Eric Welander, metallurgist, Union Malleable Iron Works, East Moline, Ill., addressed the malleable division on "Melting and Analysis Control," with J. T. Zayner, foundry metallurgist, McCormick Works, International Harvester Co., Chicago, as chairman.

Speaker for the gray iron group was Elmer J. Carmody, foundry engineer, Charles C. Kawin Co., Chicago, and his subject, "Charging Methods." W. A. Balton, assistant foundry superintendent, Link-Belt Co., Chicago, presided. Two motion pictures illustrating methods augmented the program. — *Erle F. Ross and Howard C. Tuttle.*

New England

APPROXIMATELY 175 New England foundrymen gathered at the Engineers Club, Boston, on Mar. 9 for dinner and a talk by Prof. Howard F. Taylor, Massachusetts Institute of Technology. This was probably the largest meeting of the New England Foundrymen's Association in recent years, an indication of the interest of foundrymen not only in the speaker, but also in his subject, "Nodular Iron."

Professor Taylor described English and American practices for producing this type of iron, and showed several slides illustrating its microstructure and physical properties. Many questions were asked regarding applications and the economic aspects. What will happen remains to be seen, but it is possible that eventually this new cast iron of such widely varying properties may be a serious competitor to other cast metals.—*Walter M. Saunders Jr.*

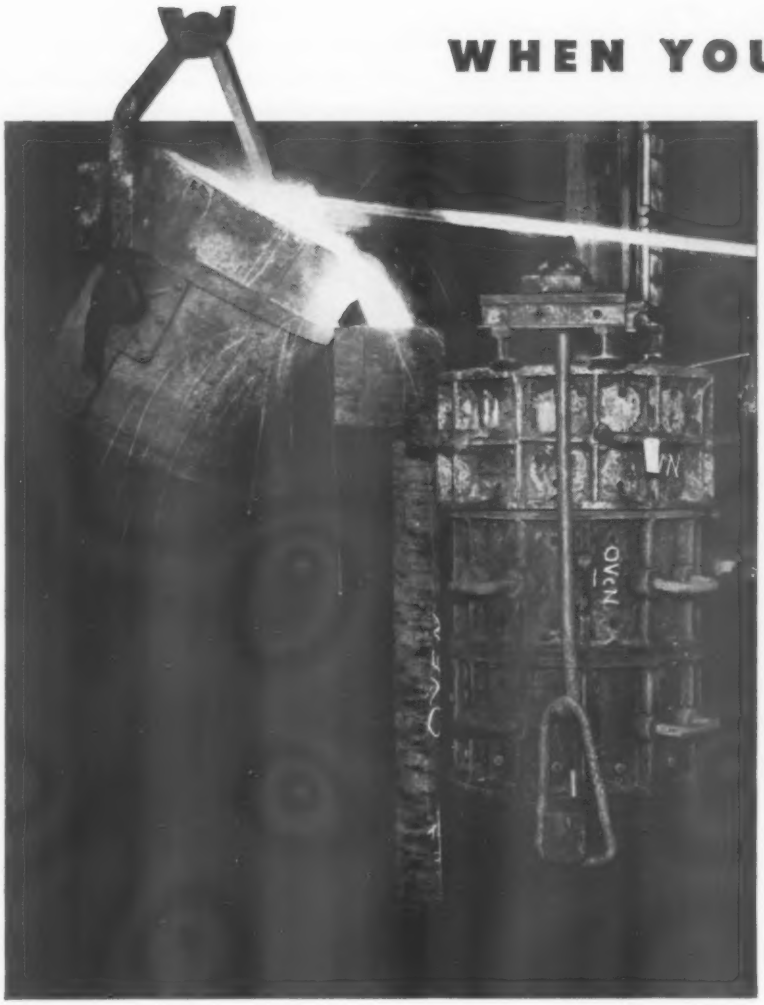
Central Ohio

CENTRAL Ohio Chapter of the AFS met at the Bancroft Hotel, Springfield, O., Apr. 11 to institute a new policy of holding at least one meeting a year outside of Columbus, O. A turnout of about 125 members and guests witnessed the showing of a Naval Research Laboratory movie on the gating of molds, and heard Clyde Sanders, American Colloids Co., speak on molding and core sands.

Mr. Sanders explained his belief that the grain distribution of molding and core sands should cover a wide range of screen sizes—at least five screens in the standard AFS series. Such sands are said to give

(*Continued on page* 177)

WHEN YOU'RE CASTING FOR



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In close-tolerance cereal flaking rolls, such as the one being poured in the above illustration, there is an important cost-wise reason for the use of Republic CHATEAUGAY Pig Iron: TOP-MACHINABILITY in the finished castings.

Castings made with CHATEAUGAY can be milled, drilled, turned, tapped and threaded, ground or otherwise machined both easily and economically. Yet, exceptional machinability is only one of many advantages afforded users of this low-phosphorus, copper-free iron.

CHATEAUGAY consistently out-performs other irons in countless applications. It flows smoothly, sets rapidly, cools evenly, increases strength, and its uniform distribution of chemical elements means a dense, fine grain structure in *all* castings, regardless of size or shape.

A Republic Pig Iron Metallurgist will be glad to give you the entire story about CHATEAUGAY Pig Iron at your convenience. Write to:

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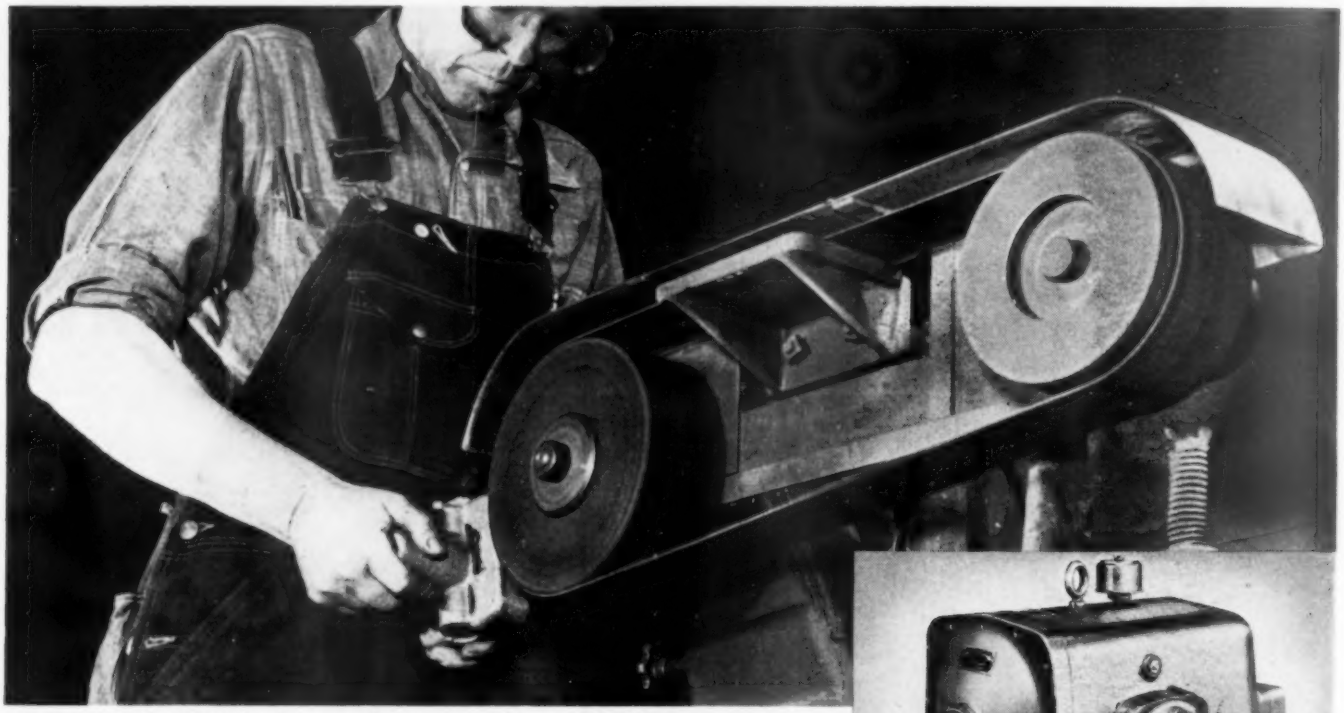

QUICK, SMOOTH FINISH for brass and bronze castings with this inexpensive bench backstand grinding unit. Tri-M-ite Cloth Belts backed with a "K" Contact Wheel have speeded metal finishing over three times as fast as previous equipment.

OILGEAR 35 HP TWO-WAY VARIABLE DELIVERY PUMP—typical of the products being turned out *faster* with the help of belt grinding.

Belt grinder pays for itself in one month!

When a 3M Methods Engineer suggested a bench backstand grinder for grinding and finishing brass, bronze and steel castings, steel plates and bar stock at The Oilgear Company, Milwaukee; he may have used the familiar phrase, "It'll pay for itself."

This large user of steel plates, bar stock, forgings and castings gave our Engineer a chance to prove this statement . . . and the equipment saved its original cost during its FIRST month of operation.

Recapturing the cost of a unit of plant equipment in one month is unusual, but we can point out hundreds of users throughout the country who have cut grinding and finishing costs and stepped-up production three to four times over previous methods.

If you grind or finish metals, plastics, wood or glass, flat or contoured surfaces, you'll want more information on this production line cost-cutter—Belt Grinding. The coupon below will bring you an informative booklet and, if you like, the services of a 3M Methods Engineer to help analyze your operations. No obligation, of course.

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(*Continued from page* 174)

the best combination of high strength, flowability, and low metal penetration.

He also presented evidence that the thermal conductivity of molding sand can affect the occurrence of shrinkage defects in iron castings. Hard rammed molds, and molds made from high density grain distribution, have higher thermal conductivity than molds which contain more void space. The high-conductivity molds abstract heat more rapidly from the metal and thus provide increased chilling action which can be used to control directional solidification. Preferential solidification in castings also can be obtained by using high conductivity special sands such as zirconia.—*H. W. Lownie Jr., Battelle Memorial Institute.*

New Jersey

PRINCIPAL speaker at the regular dinner meeting of New Jersey Foundrymen's Association Apr. 18 was Frank G. Steinebach, editor, THE FOUNDRY. He commented on the general outlook for the foundry industry, predicting that once present business adjustments have been made, production probably would stabilize around the 1944 level, with output of ferrous castings amounting to possibly 12,500,000 against 15,500,000 tons in 1948. He thought that the estimated output of 16,500,000 tons in 1948 for all types of castings would represent a peak not surpassed or equaled for some time to come.

He expressed the opinion that foundrymen might hasten the return of increased castings sales by reducing costs to permit lower prices. By way of cost reduction, he suggested the elimination of waste under procedures that developed during recent periods of high pressure operation. And, in his opinion, although mechanization, judicially applied, would affect substantial savings, the average foundryman could accomplish much by rearranging his existing equipment and facilities.

Mr. Steinebach went on to say that foundry research is making impressive strides, and he wondered if foundrymen were putting the findings into practical operation as quickly and thoroughly as they should. Is the average foundry management studying research reports as received and passing them along to key men for general discussion and possible application?

Don. J. Reese, International Nickel Co., New York, discussed developments in the use of spheroidal cast iron. He said that 60 foundries were

(*Continued on page* 180)

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	"MOLDUKO"* CORE & MOLD WASH Produces smooth castings—Stops "burning in"—Airdries Will ship **10 Gals. of Molduko & 25 lbs. of Filler** at full drum prices for test purposes.
	HYDRO GRAPHITE ***(It's New!)*** Excellent permanent mold wash.
	"CARBON-RAISER"* (Add to the metal in the ladle, at the spout, in the furnace or in the cold charge) **IRON FOUNDRIES** use to control depth of chill and improve the machineability of the castings. **STEEL FOUNDRIES** use to control carbon content, in the ladle and in the furnace quickly, accurately and efficiently.
	PARTING Non Silica or Tripoli, Highest Quality
	PIPE REDUCER Used on "Gates" and "Risers" in Steel & Iron foundries.
	PLUMBAGO & CORE WASHES In both Dry and Paste forms.
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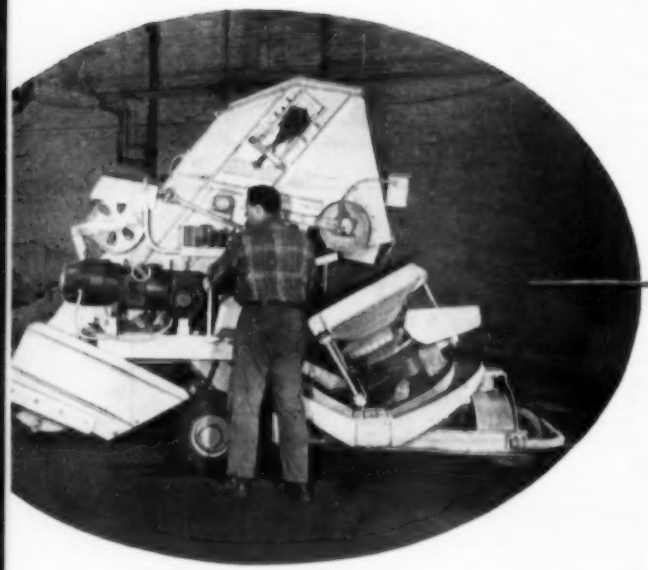
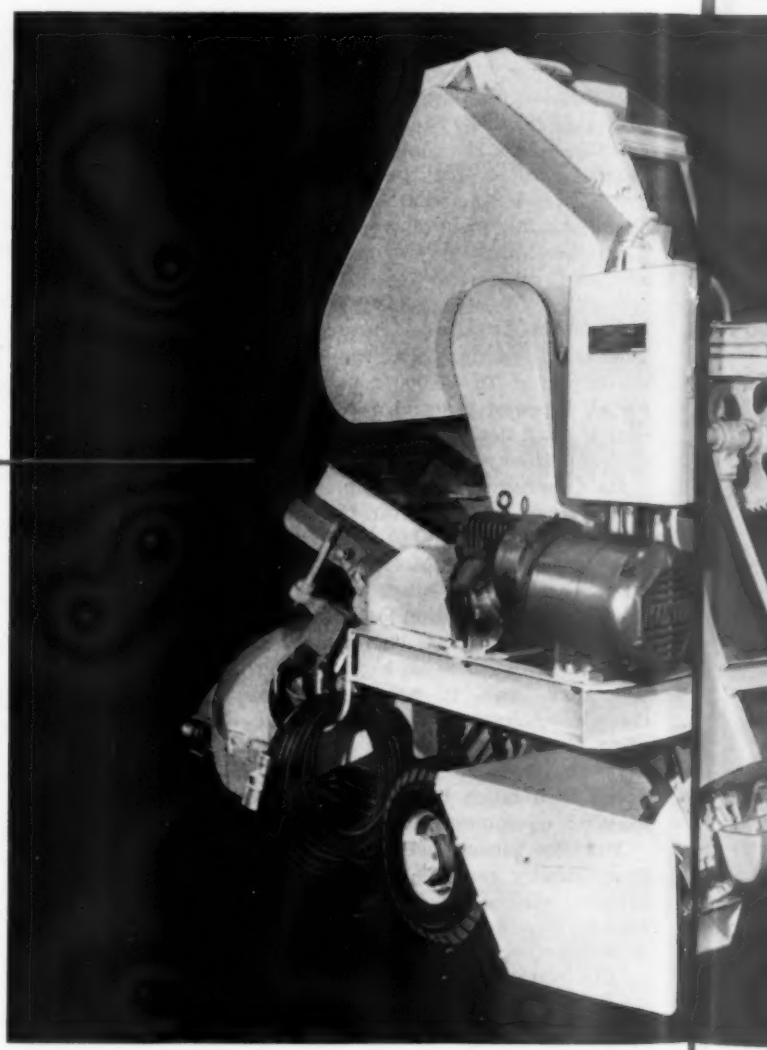
New the NITE-GANG forc





1. Maneuvered by its simple, centralized controls the Nite-Gang travels under its own power to any floor in the foundry. On reaching the floor to be conditioned the Nite-Gang is slowed to the proper crowding speed, the elevator column is lowered and the machine is moved into the unprepared sand for loading.

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2. As the Nite-Gang moves into the unprepared sand, the rotating spiral completely blends all of the sand in its path and conveys it to the bucket elevator. The buckets elevate the blended sand and discharge it onto the magnetic separator which removes the scrap from the sand before screening . . . even iron shot too small to be removed by a riddle is magnetically separated.

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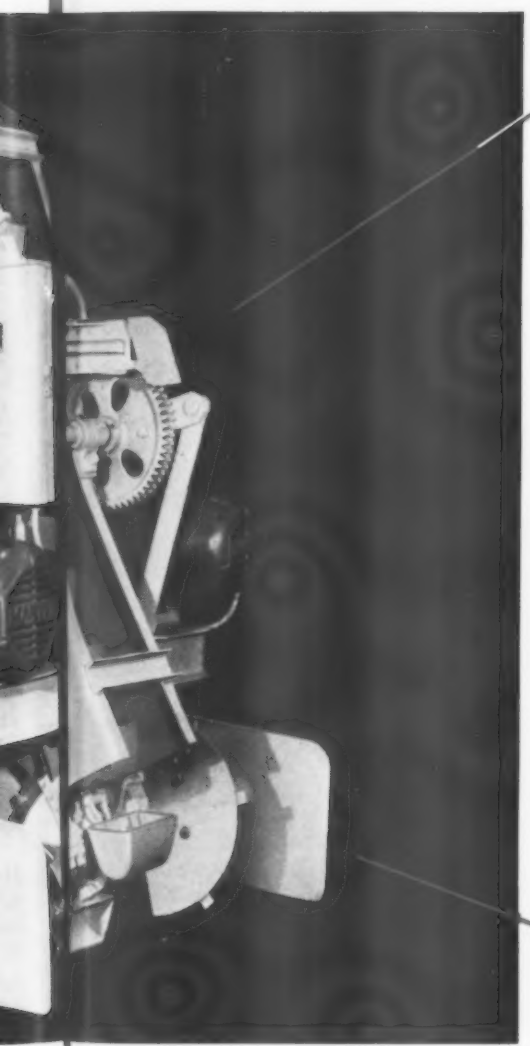

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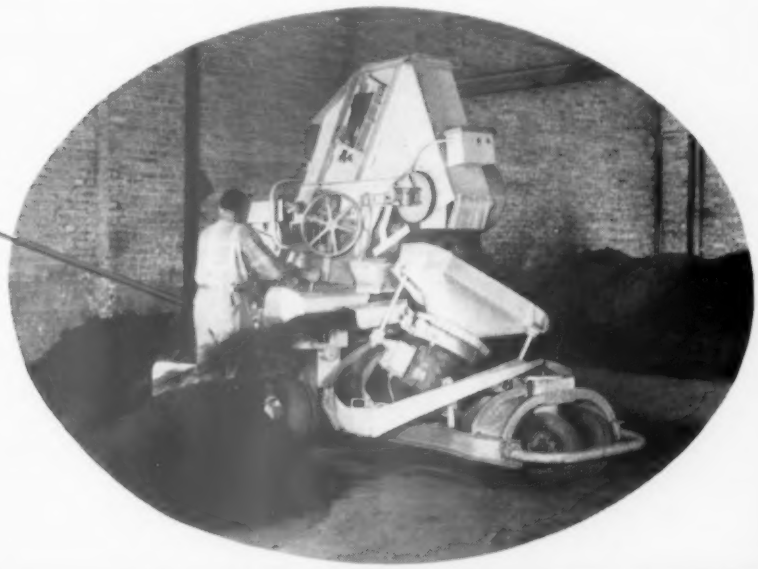

3. The blended, iron free, sand is discharged into the M5 Screenarator Unit which screens, double aerates, and discharges the completely conditioned sand to any desired distance within forty feet.

The Screenarator Unit is mounted on a swivel base, permitting the sand to be windrowed or piled at either side of, or behind the machine within an arc of 240 degrees.

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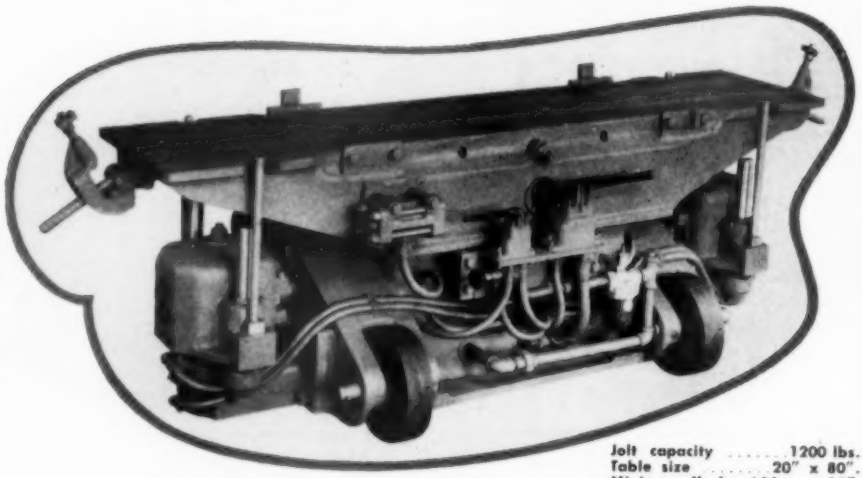

Jolt capacity ..... 1200 lbs.
Table size ..... 20" x 80".
Minimum flask width .... 17".
Pattern draw ..... 6".

The new SPO No. 3086-S machine was designed specifically for a purpose; namely, for making long, narrow molds. The design embodies a long, oblong striking surface for the jolt table, eliminating destructive whipping in the ends of the mold during the jolt operation.

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(Continued from page 177)

licensed to use his company's process and that six more were starting production of this iron during the current week. He expressed the opinion that this process, along with various other technological developments, eventually would expand the use of castings substantially.

G. W. Hannay, Barnett Foundry & Machine Co., Irvington, N. J., and head of the committee on arrangements, announced that the association plans to hold its annual outing at the Twin Brook Country Club, Watchung, N. J., on June 16.—*B. K. Price.*

Saginaw Valley

APPROXIMATELY 140 members and guests of the Saginaw Valley Chapter of the AFS met at the Fisher Hotel, Frankenmuth, Mich., Apr. 7 to hear Frank G. Steinebach, editor, THE FOUNDRY, discuss "What's Ahead in the Foundry Industry."

Mr. Steinebach stated that every foundryman has a definite responsibility in the promotion of the foundry industry, and pointed out that the industry plays an important part in the national economy.

Coffee speaker was Kenneth H. Priestley, Vassar Electroloy Products Inc., who showed colored slides covering a recent vacation trip to Mexico and Mexico City.

Officer and director nominations for the coming year are: Chairman, Lyle L. Clark, Buick Motor Division, General Motors Corp.; vice chairman, Howard H. Wilder, Foundry Division, Eaton Mfg. Co., and secretary-treasurer, Raymond Klawuhn, General Foundry & Mfg. Co. Directors for three years are: A. T. Peters, Dow Chemical Co.; Frank A. Buike, Almont Mfg. Co., and Harvey Durham, Chevrolet Grey Iron Foundry, division of General Motors Corp.—*Kenneth H. Priestley, Vassar Electroloy Products Inc.*

Central Indiana

A WARNING that buyers now are demanding a better finish on all castings opened an interesting discussion on "Malleable Iron Finishing" by Earl M. Strick, finishing superintendent, Erie Malleable Iron Co., Erie, Pa., at the Apr. 4 meeting of Central Indiana Chapter of the AFS, held at the Athenaeum, Indianapolis.

Addressing the more than 125 foundrymen present, Mr. Strick pointed out that competition from other products such as stampings, forgings and plastics, is getting tougher all the time and he urged

closer co-operation between customer and foundry; greater efficiency and control of cleaning operations; and closer inspection of castings. Much unnecessary cleaning is done because the customer is not consulted as to what machining will be done later, Mr. Strick continued.

Greater efficiency in cleaning can be gained by closer co-operation between all departments of the foundry. Actually, cleaning operations should begin in the pattern shop. In his opinion, inspection is one of the most important and one of the most undeveloped departments in the foundry, and the chief inspector should be responsible only to the general manager.

In conclusion, Mr. Strick discussed methods of determining the best grinding wheels for a given job, stressed the fact that castings should be cleaned after grinding to remove grinding marks, and brought out the importance of packing castings for annealing to prevent warpage.

Wilbur Wolfe, assistant chief inspector, National Malleable & Steel Castings Co., Indianapolis, introduced the speaker.—*William K. Mitchell*

Pittsburgh

FRED G. SEFING, metallurgist, International Nickel Co., New York, addressed the Pittsburgh Foundrymens' Association, Apr. 18, at the Fort Pitt Hotel, Pittsburgh, on the general subject of "What Does Testing a Casting Mean?" Due to the unusual interest indicated by local foundrymen in the new ductile or nodular gray iron, Mr. Sefing also presented some slides and a brief description covering this new engineering material.

The relative value of various methods of testing a casting were elaborated on by Mr. Sefing, with emphasis on specifications and testing which evaluate the serviceability of the casting, particularly from an engineering standpoint. His entire talk was profusely illustrated with slides, pointing out new techniques used in testing castings.

Such testing procedures as the following were discussed: X-ray; hardness (correlation with strength and machinability); magnaflux; tensile or compression strength of highly stressed areas; microstructure; and pressure tightness. Coupon test bars also were discussed in detail.

Mr. Sefing made the point that metallurgists should play a more important part in the determination of the design of castings from a practical operating standpoint. Properties wanted in the specifications for castings include: Strength; machinabil-

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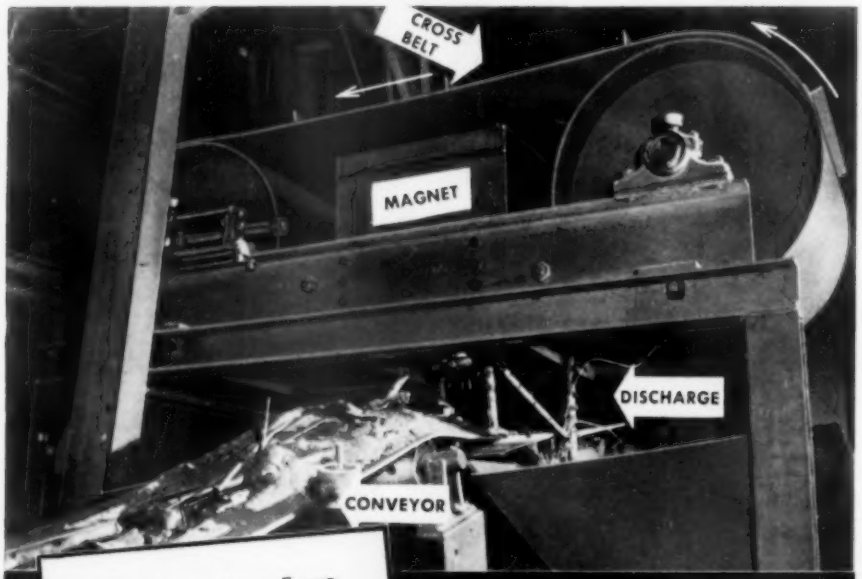

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SAVES 48 man hours per day — eliminates need for two pickers and one shoveler each shift because iron is now discharged to waist high hopper instead of to floor!

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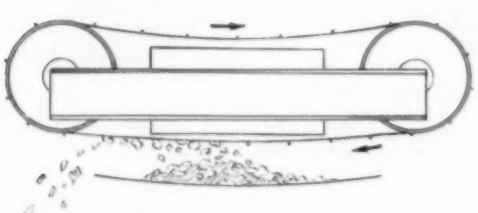

Iron is picked off conveyor by powerful magnetic pull, held tight against underside of moving cross belt which sweeps it out of magnetic field where it discharges into a chute or receptacle

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ity; hardness; wear resistance; soundness or pressure tightness; and modulus elasticity.—*Joseph C. Sullivan.*

Metropolitan

METROPOLITAN Chapter of the AFS met at the Essex House, Newark, N. J., Apr. 4 to hear George H. Bradshaw, superintendent of foundries, U. S. Naval Shipyard, Philadelphia, discuss "Foundry Practice on Copper-Base Alloys."

He discussed many phases of foundry practice, including gating methods, effect of mold materials and mold temperatures on shrinkage, use of dry nitrogen gas for degasifying melts, the effect of foundry atmosphere on casting quality, and synthetic vs. natural bond sand. He also spoke of the use of x-ray inspection of nonferrous castings and showed slides illustrating unsoundness in castings.—*George Baer, Atlas Foundry Co.*

HEAT ABSTRACTION BY MOLDING MATERIALS

(*Continued from page* 97)

erties of different materials if the insulating cover is not used.

Materials Tested — The various mold and chill materials tested by means of the cup just described included the following:

1. Ottawa silica sand (80 per cent), portland cement (11 per cent) and water (9 per cent). Molds made of this mixture were set and air dried three days before testing. Apparent density was 0.0655 and 0.0671 lb per cu in. Screen analysis of the Ottawa silica sand is shown in the accompanying table.

2. Loam sand (94 per cent) and water (6 per cent). This is a natural sand containing the required amount of clay for bonding purposes. After air drying for several days the mold was baked at 500°F for two hours before testing. Apparent density 0.0657 and 0.0670 lb per cu in., screen analysis as shown in the table.

3. Black core sand. This is a mixture of silica sands containing clay and pitch as a binder. The mold was air dried ten days and baked at 450°F before testing. Apparent density 0.0638 lb per cu in., screen analysis as shown in the table.

4. Green facing mold sand. This is a natural sand containing the necessary clay bond and 5 to 7 per cent

(*Continued on page* 184)

developed for faster blocking and more effective penetration—

Since its introduction in 1945, Ohio Ferro-Alloys Special Blocking 50% Ferro-Silicon has established the following advantages:

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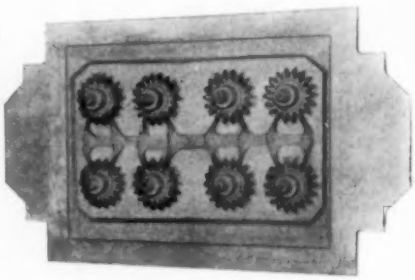

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(*Continued from page* 182)

seacoal. Moisture content is approximately 5 to 6 per cent when mixed. Since there was a time lapse of about one hour between making the cup mold and pouring the metal, the moisture content may have been somewhat less. Apparent density 0.0495 and 0.0535 lb per cu in., screen analysis as shown in the table.

5. Ramtite-(Special Super No. 25) manufactured by the Ramtite Co., Chicago. This is a firebrick grog mixture supplied in mud form. After air drying the mold for seven days it was fired at 2300°F (limit of furnace facilities) for four hours. Commercial firebrick is usually fired at approximately 2900°F. The resulting cup mold had an apparent density equal to the average of low and high density firebrick. Apparent density 0.072 lb per cu in.

6. Berlite. This is a refractory furnace cement made by Ironton Fire Brick Co., Ironton, O. The mold was baked at 500°F for two hours before testing. Apparent density 0.074 lb per cu in.

7. Ottawa silica sand (92.6 per cent), cereal binder (0.8 per cent), core oil (0.7 per cent) and water (5.9 per cent). The mold was baked at 410°F. Apparent density 0.0629 lb per cu in.

8. Oil core sand consisting of bank sand (92.6 per cent), cereal binder (0.8 per cent), core oil (0.7 per cent) and water (5.9 per cent). Molds made of this mixture were baked at 410°F. Apparent density 0.0549 to 0.0613 lb per cu in.

9. Cast iron. Apparent density 0.268 lb per cu in.

All cup molds were given one coat of aqueous plumbago blacking on the inside surface.

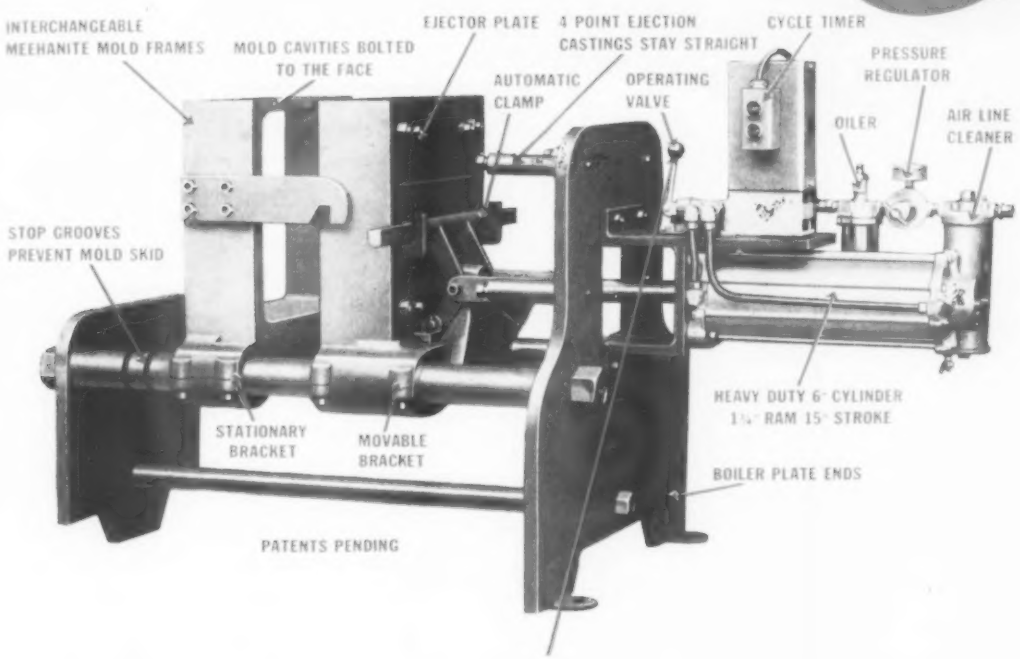
Results—The results of the tests are shown by the time-temperature cooling and heating curves in Figs. 2, 3 and 5. Figs. 2 and 3 are curves showing the reproducibility of results obtainable in separate heats on the same molding material. The difference in the cooling rates may be partially attributed to the difference in the apparent density of the mold. The variation in density in turn can be attributed to the manual methods of ramming the mold.

The time-temperature relationship, as represented by the cooling curve of the cast iron at the mold bottom, is a relative measure of the heat abstracting properties of the particular mold material being tested. The heating curve of the mold taken 1½-in. from the bottom metal interface gives an indication of the thermal conductivity of the mold material,

(*Continued on page* 186)

MASTER PNEUMATIC DRAW TABLE

for Aluminum Permanent Molds



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Melters' Handbook

(*Continued from page* 184)

and provides some explanation of the mechanism of heat transfer when water vapor and organic substances are present.

Fig. 5 shows a group of cooling curves from different molding materials having a wide range of apparent densities. The quantitative significance of these curves is more apparent if the cooling rate is plotted against apparent density, as shown in Fig. 4. The cooling rates, as plotted, were obtained by dividing the temperature difference between the actual pouring temperature 2560° F and 1800° F by the time required for the metal to cool to 1800° F. The 1800° F temperature was arbitrarily selected.

The two straight lines, one for clay-bonded sands and one for oil-bonded sands, indicate for practical purposes that the rate of heat abstraction of the molding material is proportional to the apparent density. The oil-bonded sands show a lower heat abstracting capacity than the clay bonded sands. This may be due to the insulating effect of the organic film and carbonaceous residue formed after pouring, which separates the sand particles.

Screen Analyses of Sands

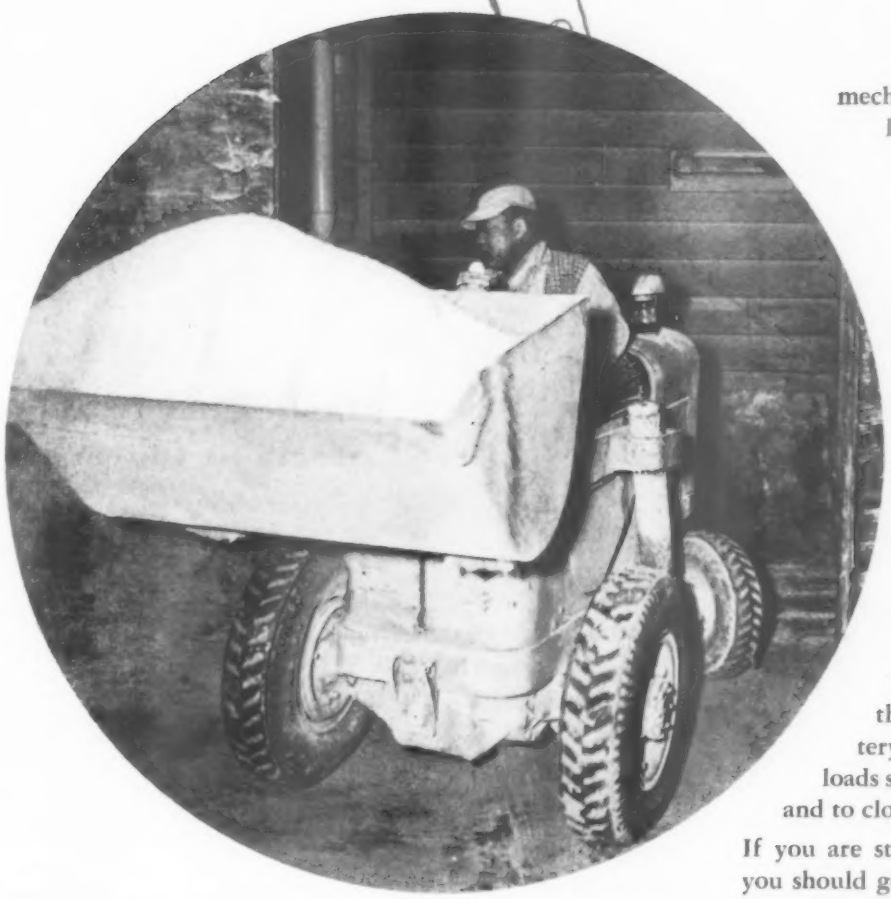
Per Cent Retained on:	Ottawa Silica Sand	Loam Sand	Black Core Sand	Green Facing Sand
6 mesh ..	...	...	.2	...
12 mesh ..	...	.6	.2	.2
20 mesh ..	...	5.6	2.2	.6
30 mesh ..	...	15.2	5.4	.8
40 mesh ..	1.4	20.6	11.2	2.0
50 mesh ..	24.8	16.2	19.6	16.0
70 mesh ..	40.4	11.4	14.8	21.0
100 mesh ..	25.6	5.6	13.4	20.2
140 mesh ..	6.4	2.6	10.2	17.6
200 mesh ..	1.0	.8	3.6	4.0
270 mesh ..	.2	1.6	1.2	1.0
Pan	.2	6.0	5.4	2.0
Total grain .	100.0	86.2	87.4	85.4
AFS clay ..	...	13.8	12.6	14.6
Fineness No.	57.1	58.9	72.2	73.8

Since metallic and refractory chills are used for chilling local areas in castings to remove hot spots, cup molds were made of cast iron and Ramtite, a firebrick equivalent, to determine their relative heat abstracting properties as compared with regular molding sands. The results show that the relative chilling capacity of the firebrick to green molding sand is 1.5 times greater, while cast iron is 10 times greater.

For practical purposes it is unnecessary for the foundryman to know the actual value of the heat abstracting capacity of a given molding mixture. A knowledge of the relative values is all that is necessary. This can be obtained by weighing one cubic foot of the vari-

(*Concluded on page* 188)

Take the Hand Out of Bulk Material Handling!



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(*Concluded from page* 186)

ous molding sands to be compared; all rammed by the same method. The molding mixtures with the greatest apparent density will have the greatest heat abstracting capacity. This will only apply if the bonding agent such as clay is used for the sands being compared. This will also apply to a comparison of oil bonded sands.

Summary—1. A practical method for determining the relative rate of heat abstraction of various molding materials is presented.

2. The relative rate of heat abstraction for molding material is, in general, proportional to the apparent density for similarly bonded materials.

3. The clay bonded sands tested have a greater capacity for heat abstraction than oil bonded sands.

4. The chilling capacity of cast iron when used as a chill is 10 times greater than that of regular molding sand.

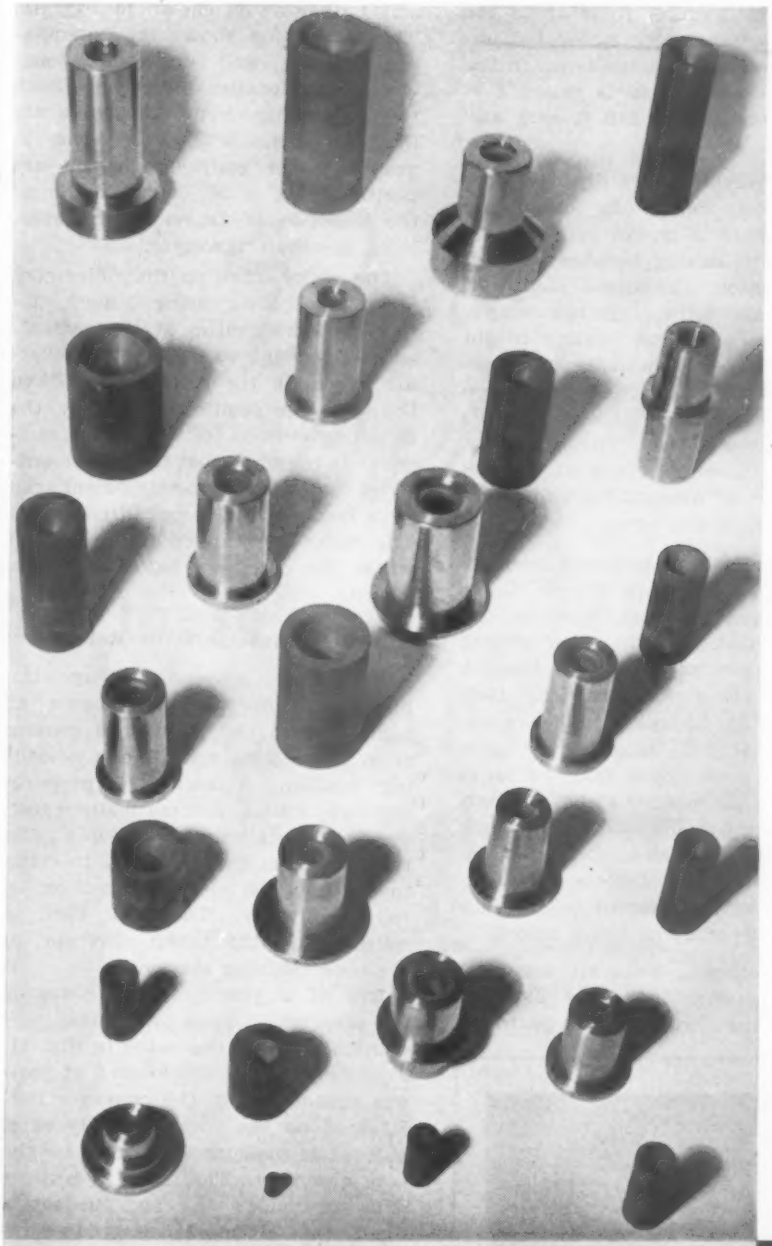
5. For practical purposes the foundryman can obtain the relative rate of heat abstraction of clay bonded materials by weighing a cubic foot of the mixtures to be compared. If the molding mixtures are rammed in a manner simulating foundry practice, the greater the density the greater will be the rate of heat abstraction.

Magnesium Group Meets at Chicago

The Magnesium Association exhibition and fifth annual meeting were held at the Edgewater Beach Hotel, Chicago, Apr. 19-20, with speakers expressing optimism regarding increased consumption and broader applications of the light metal in the future.

Progress report on the industry was delivered by W. S. Loose, general sales manager, Dow Chemical Co., Midland, Mich., who stated that what once was considered a premium aircraft material is now gaining wide recognition as a common commercial metal. He anticipates an increase in primary magnesium consumption in 1949 of about 60 per cent over the 31 million pounds used in 1948.

Officers elected at the association's business meeting are: President, Arthur Winston, Dow Chemical Co.; vice president, Bruce Magill, Dominion Magnesium Ltd., Toronto, Canada, and treasurer, Ralph Ferguson, Eclipse-Pioneer Division, Bendix Aviation Corp., Teterboro, N. J. R. B. Brown continues as executive vice president and secretary.



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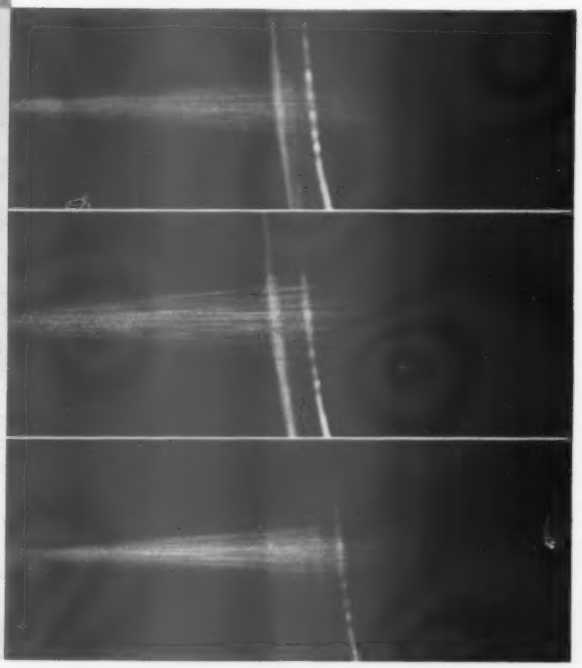

High-speed photograph of stream from new iron nozzle—note that stream concentration and abrasive velocity and volume are fair

Stream from the same nozzle after three hours with silica sand. Outlet opening worn to twice original size—stream concentration poor, abrasive velocity and volume low

Stream from Norbide Nozzle after 404 hours with sand—outlet diameter worn only 0.032"—hundreds of hours of useful life remain—marked stream concentration—high abrasive velocity and volume

HANDLING MATERIALS IN THE COREROOM

(*Continued from page* 81)

located on each side of the belt at the end of the conveyor nearest the baking oven. That arrangement prevents spilling of green cores on the floor at the end of the conveyor.

As shown in the illustration, the plates of cores are placed on the conveyor so that they extend beyond either edge of the belt, which is thick enough to prevent the plates from rubbing against the conveyor frame. The plates are placed in such a manner so that they can trip one of the levers which actuate the stopping device.

Fig. 8 shows a single-strand, continuous, overhead conveyor which travels through the coremaking section, where it is loaded, and then proceeds through a large, horizontal continuous corebaking oven.

In the foreground, the conveyor can be seen moving through the unloading zone. Its direction of travel is toward the rear, and as it descends through the unloading department, the shelves on the racks become successively lower. Thus they come to convenient unloading height progressively as the conveyor moves through the department. The bottom shelf is unloaded first and the top shelf last as the racks descend.

Cores are moved by truck from this zone to the foundry floor or to the storage section which is located under the horizontal oven shown in the background. The oven is raised 8 ft off the floor and is 120 ft long and 16 ft wide.

The conveyor passes directly from the unloading zone to the coremaking section where it moves between two rows of coremaking benches, ascending gradually. The slight incline of the conveyor track brings empty shelves to convenient loading height at progressive points in the coremaking area. Green cores are loaded on the top shelves first and on the bottom shelves last. The conveyor makes a 180-degree turn at the end of the rows of corebenches and comes back through the oven.

Another conveyorized core oven installation is shown in Fig. 9. Cores are unloaded from the racks on one side and loaded on the other side of the conveyor as it passes beneath the oven. The oven is 52 ft long, 19 ft wide and 24 ft high and has a capacity of 6250 lb of cores per hour. Conveyor is equipped with 40 racks 90 in. long, 24 in. wide and 42 in. high. Each rack has one stationary shelf and three removable shelves. Conveyor speed is adjustable so that baking time may be varied to suit different sizes of cores being baked.

An overhead monorail conveyor with removable racks for handling cores in the coremaking department and in baking is shown in Fig. 10. The illustration shows the coremaking, loading and unloading zones which are located directly beneath the corebaking oven. The cores are made on core benches adjacent to gravity roller conveyors which are positioned at a 90 degree angle to the direction of travel of the overhead monorail conveyor.

The racks stand on the roller conveyor and, after being loaded, are moved to an elevating station indicated at the point where the two levers are shown in the foreground. When the racks are positioned properly, the elevating section of the roller conveyor is raised so that the eye mounted on top of the rack may be engaged by a hook on the monorail conveyor. The racks are carried into the oven where the cores are baked and then cooled.

Rack Is Automatically Released

The rack suspended from the monorail conveyor, and shown at right rear in the picture, is coming from the cooling zone to the unloading station. A series of properly elevated rollers automatically cause the rack containing baked cores to be removed from the hook and to come to rest on the elevating section of roller conveyor. The rack then is rolled along the roller conveyor to the core cleaning station.

Use of a gravity roller conveyor for assembling cores on a mass production basis is illustrated in Fig. 11. Four or five men are located at various stations along the conveyor line. Each stops the core assembly as it passes, to add another unit to the core assembly. The cores then move onto an endless belt and through a dip-drying oven. When the cores come out of the oven on the belt conveyor, they are given a final touch-up and move directly to the molding floor where they are set in the molds.

Hoists play an important part in the lifting and moving of heavy cores. Three types of hoists, available in a wide range of capacities, most generally are used; they are manually operated or powered by electricity or air. Fig. 16 shows the use of an air motor hoist for loading or unloading core oven racks. Further application of hoists for closing and tying up cores is shown in Fig. 17. This 2000-lb capacity hoist also is air motor powered. One manufacturer furnishes that type hoist in capacities from 200 to 20,000 lb. Hoists also are used for setting cores in molds.

Core racks used for baking cores in

(*Continued on page* 192)

EFFICIENT HANDLING: International Graphite & Electrode Corp., St. Marys, Pa., manufacturer of graphite electrodes and anodes and granular graphite, has developed a new way to handle bagged materials for shipping. In this method, bags are stacked square in pairs, each pair perpendicular to the adjacent pair, on wood pallets. The top layer of bags is steel strapped and serves to keep the entire load firm. An adhesive between bags helps prevent slipping. The palletized bags then are moved easily and quickly by lift truck. Loading and unloading costs are reduced and bag damage minimized by eliminating bag-by-bag handling

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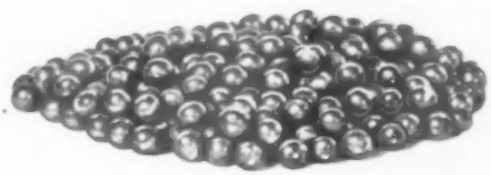

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"I like 'Certified' Abrasives. They're extra tough, keep our blast-cleaning operations at top-efficiency. Clean better, produce a better product, and that means more sales."
" 'Certified' abrasives suit me to a 'T'. I always specify 'Certified' because they keep blast cleaning costs at rock bottom. Actually cost less because they can be used over and over and over."
"Blast cleaning's easier with 'Certified.' Since using Samson Shot and Angular Grit my crew turns out more work every day—and it's better work, too. Keeps costs down and makes my bosses happy!"
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BOSTON, MASS.

(*Continued from page* 190)

batch ovens, and which also find application as core storage units, are illustrated in Fig. 14. The smaller type rack, such as that shown at the left, is placed near one or two core makers who set their cores on the shelves. The loaded rack is carried to the oven and placed inside by a hand or power lift truck. Upon completion of the bake, the rack is removed from the oven and becomes live storage for cores before they are sent to the finishing department. One manufacturer offers these racks in sizes ranging from 3 x 5 x 6 ft high to 5 x 6 x 6 ft high with any number of shelves, depending upon requirements of the purchaser. Shelves are adjustable on 4-in. centers. Special size racks also are built.

The truck on the right is larger and of heavier construction. It is mounted on wheels which run on tracks leading into the oven. Such racks usually are of greater capacity but are not so versatile, being confined to movement on the rails in the oven and a short distance in front of the oven. The rack pictured measures 4 x 6 ft, with adjustable shelves, and has a capacity of 10 tons. Many of these larger type racks are pulled in and out of the oven by a capstan, instead of being pushed and pulled manually.

Racks Carried on Rails

The use of racks in conjunction with an overhead tram rail system for moving the racks into and out of batch core ovens is shown in Fig. 15. In this installation racks are moved into and out of the oven manually, and they may be shifted about from one oven to another through switches on the conveyor system. This type of system ordinarily is adopted where floor irregularities exist, or the racks are to be moved into a part of the plant where the floor is unsuitable for racks mounted on wheels or for lift truck operation.

Various types of conveyors or trucks are used to move finished cores to the foundry floor. Fig. 19 shows one type of hand-pushed core truck. The loading surface of this truck is made of reinforced sheet steel 27 in. wide and 60 in. long. The combination of coil springs — mounted in the vertical pipe sections into which fit short pieces of steel rod attached to the load-bearing top—and elliptical springs, visible in the illustration, provides the required resiliency under both light and heavy loads. Load capacity of the truck is 600 lb. Other core trucks offered by the manufac-

turer of this truck have capacities ranging from 500 to 1400 lb.

The same company also offers small, one or two-wheel core barrows which are more maneuverable and thus adapted to hard-to-get-into places around the foundry and for delivering large single cores to molders. A resilient multiple-shelf core truck, designed for movement of cores around the coreroom or, when carried by a lift truck, for delivery of cores directly to the foundry, also is available. These trucks resemble core racks such as is shown in Fig. 14, except that they are mounted on wheels and each shelf is suspended at the four corners on springs to provide shock absorption during the transportation of cores.

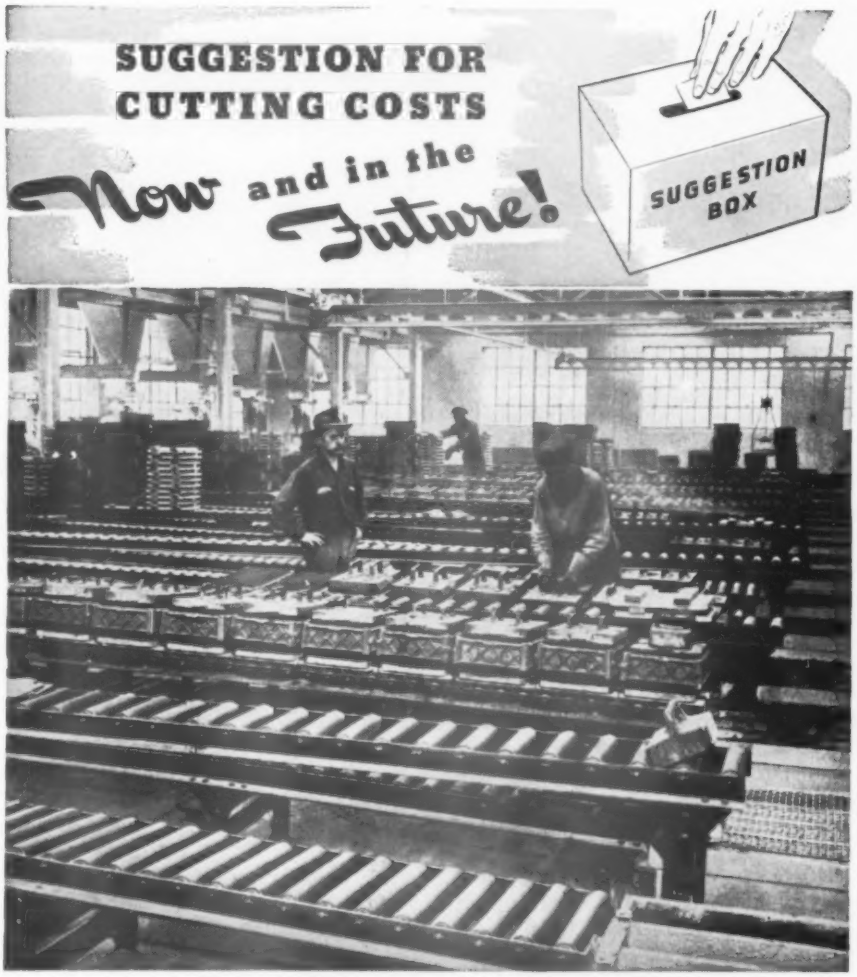
Cores Moved on Elevator

When it is necessary to transport cores from one floor to another, an elevator can be used to advantage. Fig. 18 illustrates an elevator installed in a coreroom which has production facilities on the second floor and finishing operations and storage on the first floor. Cores are shown being loaded on the elevator at production level. Note that cores are stacked on boards and that empty boards are returned on the up-going side. During production on the upper level, cores are removed from the driers when they are taken from the oven, and placed on boards for transportation down the elevator. This is done to speed up drier turnover.

Although this coreroom is equipped with a vertical oven, and cores could be unloaded from the oven at storage floor level and the driers returned to the production level on the oven conveyor, a considerably larger number of driers would be required; this is because of the fact the driers would spend a greater amount of time traveling from the point where baked cores are removed from them, to the benches where green cores are placed in them. In this installation the cores are removed from the driers as soon as they are taken from the oven on the production floor and returned immediately to coremakers for reuse.

Sources of Illustrations

Figs. 1, 3, 8, 12, 14, 18—Foundry Equipment Co., Cleveland.
Fig. 2—National Engineering Co., Chicago.
Fig. 4—C. O. Bartlett & Snow Co., Cleveland.
Figs. 5, 6, 7—American Monorail Co., Cleveland.
Fig. 9—Despatch Oven Co., Minneapolis.
Figs. 10, 15—Carl-Mayer Corp., Cleveland.
Fig. 11—Werner G. Smith Co., Division of Archer-Daniels-Midland Co., Cleveland.
Fig. 13—Link-Belt Co., Chicago.
Figs. 16, 17—Ingersoll-Rand Co., Phillipsburg, N. J.
Fig. 19—Chicago Mfg. & Distributing Co., Chicago.



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Roller conveyors are unequalled in low first cost, flexibility and minimum operating expense. They handle a wide range of commodities—molds, castings, parts, units, barrels, bundles, drums, boxes. They are available in light, average, or heavy-duty types for either portable or stationary use—in a wide variety of sizes, styles and lengths. Roller conveyors are built in their entirety by Standard, including the vital bearings which are manufactured expressly for severe foundry service.

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INDUSTRY Briefs

EUTECTIC Welding Alloys Corp., 40 Worth St., New York 13, recently acquired a new plant at Flushing, N. Y. The plant occupies approximately 100,000 sq ft and houses a foundry, metal rolling and drawing plant, extrusion presses for producing coated electrodes as well as alloy cutting facilities. It also will contain a complete gas welding division plus special control and research laboratories. Additional buildings that will complete the company's expansion plans by midsummer are being planned.

* * *

Cutler-Hammer Inc., 315 North Twelfth St., Milwaukee 1, has opened a branch office at 155 Washington St., Newark, N. J., headed by W. M. Reese. The Columbus, O., office, under the direction of R. D. Yoder, is now located at 2700 East Main St., and the Youngstown, O., office, headed by E. H. Gove, is now at 25 East Boardman St. The Detroit sales office and warehouse has been moved to 15427 Woodrow Wilson Ave. E. F. Weiss is Detroit district manager.

* * *

Charles E. Roland, instructor in foundry practice at Lane Technical High School, Chicago, has established a consulting service in estimating of castings weights. Blueprints may be sent to his office at 215 Forest Dr., Itasca, Ill. Mr. Roland formerly was sales engineer, American Steel Foundries, and sales representative, McCarthy Foundry Co., both of Chicago.

* * *

D. J. Murray Mfg. Co., Wausau, Wis., has appointed the following agents as distributors of its unit heaters and allied products: I. Ernest Shaer, 161 Devonshire St., Boston 10; G. T. Pottinger & Co., 2475 Rivers Rd. N. W., Atlanta; Jordan Engineering Co., Traction Bldg., Cincinnati 2, and Lefler Wyomont Supply Co., P. O. Box 2166, Casper, Wyo.

* * *

Hyster Co., 2905 N. E. Clackamas St., Portland, Oreg., has appointed McCall-Boykin Co., Baltimore, and Machinery & Supplies Co., 2000 Walnut St., Kansas City, Mo., distributors of its lift trucks, straddle trucks and mobile cranes. W. S. Boykin is president of the McCall Co., and George W. Gagel is president and general sales manager of Machinery & Supplies Co.

* * *

Foundry of the Ryther & Pringle Co., Carthage, N. Y., has been leased by Carl F. Fogarty, Carthage, and Nelson J. Malboeuf, Natural Bridge, N. Y., as partners. William G. Lewis, Watertown, N. Y., and Walter Clinch, Carthage, who purchased the company early this year, will continue management and operation of the machine shop.

* * *

Manchester Foundry Inc., 118 Maple St., Manchester, N. H., is discontinuing operations. William F. Griffin, president, will become manager of Rollstone Foundry Inc., Crocker St., Fitchburg, Mass., and all work previously done at Manchester will be transferred to Rollstone.

* * *

Mt. Pleasant Pattern & Casting Co., 116 S. Depot St., Mount Pleasant, Pa., recently has been organized by H. Wilmoth, president, C. A. Bodle, vice president, I. C. Davis, treasurer, and C. E. Weinkauf in charge of sales. The company will specialize in aluminum and copper castings and cast matchplates.

* * *

Martin Foundry Co., 408 West Third St., Covington, Ky., has acquired tools and certain stock of the foundry department of Shepard Elevator Co., 2425 Colerain Ave., Cincinnati. Equipment is being moved to the Covington plant for expansion of the machine tool casting department.

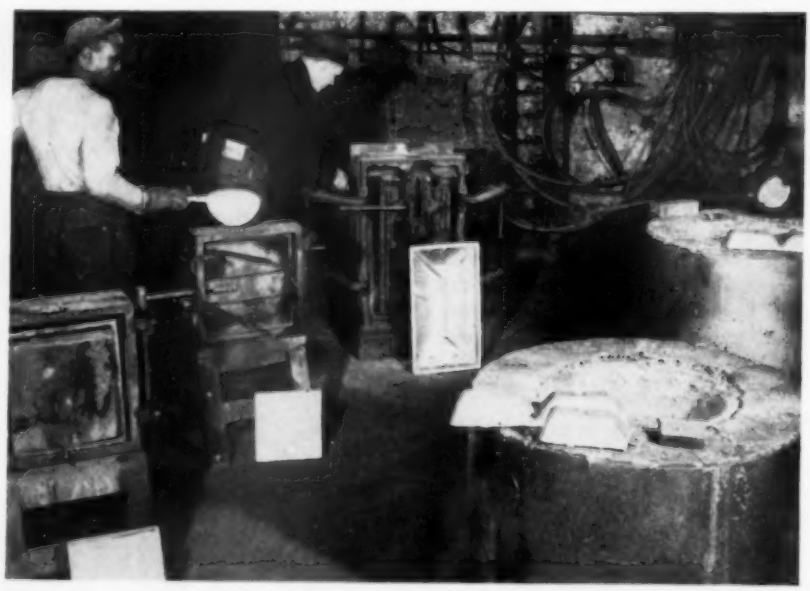
* * *

Baltimore Foundry & Machine Corp., 1901 South Charles St., Baltimore 30, plans construction of a one-story foundry addition measuring 36 x 40 ft. The company is a branch of McConway & Torley Corp., 48th & Dunbar Sts., Pittsburgh.

* * *

Mathieson Chemical Corp., 60 East 42nd St., New York, which acquired recently the local plant of the Standard Wholesale Phosphate & Acid

(*Concluded on page* 196)



PERMANENT MOLD CASTING: Section of the new permanent mold casting division of Wellman Bronze & Aluminum Co., Cleveland. Present capacity is up to 600 aluminum and magnesium castings a day. The 600-pound capacity holding furnaces shown here were designed and built by the company and are typical of those used in the new division

A Practical Foundry Man Speaks on Bayflex®

City Brass Foundry

Brass, Bronze, Aluminum Castings, Babbitt and Solder

323 DANFORTH STREET
FALL RIVER, MASSACHUSETTS May 10, 1949

Bay State Abrasive Products Company
Westboro, Massachusetts

Gentlemen:

This letter is written to express our gratitude. The facts are as follows:

My father and I have been in the non-ferrous foundry business for thirty years. For twenty-eight of those thirty years one of the curses of our business was cutting off gates and risers, snagging off the stumps, and removing the imperfections at the parting line of the cope and drag. For twenty-eight years, during which time we must have performed these operations at least half a million times, it was always a case of doing a dangerous, difficult and annoying job -- we hated it.

For the last two years, the curse has been taken off the job because we have been using Bayflex and that is why we are grateful!

We think other non-ferrous foundry men will also be grateful if you will tell them in simple straightforward language about these tough, efficient, and extremely useful wheels. We know the foundry business and foundry men. Foundry men are not easily fooled. We suggest you tell these men just four things -- they ll find out the other virtues quickly enough.

1. Bayflex is a very strong, tough wheel and therefore very safe to use.
2. They cut brass, aluminum and other non-ferrous compositions quickly, easily and always remain sharp.
3. These Bayflex wheels cut on the face and both sides so that the gates and risers can be cut off flush with the adjacent surface and thus eliminate snagging. In other words, concurrent cut-off and snagging.
4. The wheels out last the old-fashioned, fragile cut-off wheels several hundred to one.

We are moving to larger and much better premises and we will be glad to have you see Bayflex used as we use it when we get setup in our new quarters.

The attached photographs will prove interesting to you.

You are free to use this letter if it will help you in telling the Bayflex story to other non-ferrous foundry men. Once they use Bayflex they will also be grateful just like ourselves.

Yours very truly,
Earl H. Eller
Proprietor

This unsolicited letter speaks for itself. We suggest that you try Bayflex wheels. A demonstration of their effectiveness in your foundry is gladly offered. No expense to you.

Write us today.

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This cut is being made to conform with the contour of a large casting, proving the strength and flexibility of BAYFLEX.

A 14" x 5/32"—24 Grit BAYFLEX wheel cutting off a sprue attached to an awkward shaped casting.

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Top Performance Consistently Duplicated

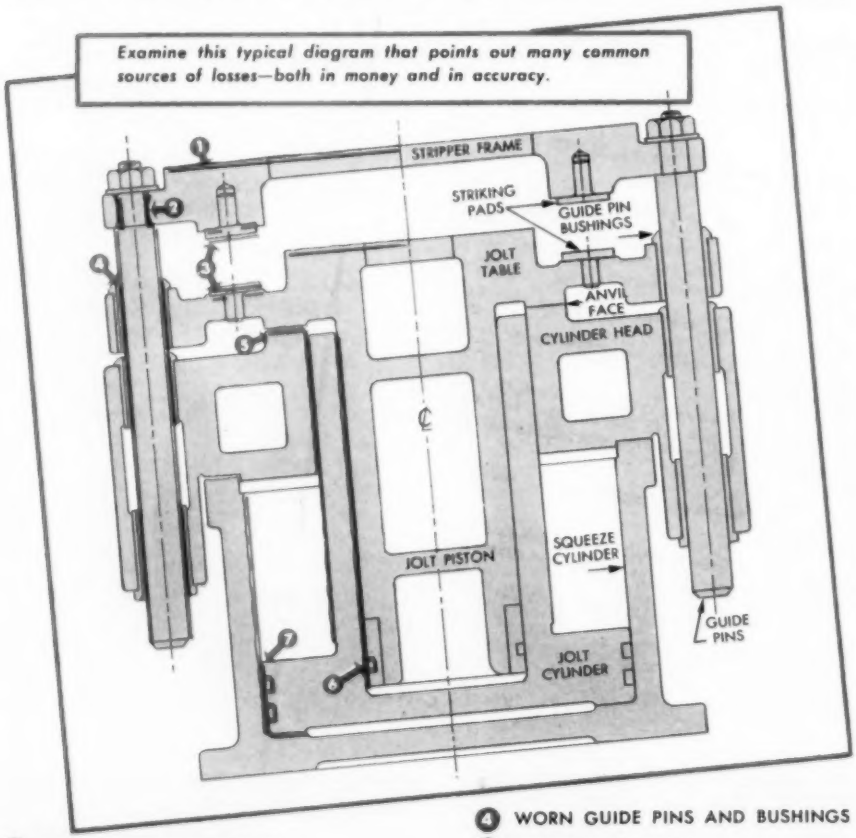
STOP MAKING SCRAP!

Increase your yield

Stop operating your machines with worn parts

The longer you put off correcting this condition, the faster the parts wear; the greater is the loss of production, less accurate are resulting pieces, and the more is the cost of repair. Worn machines produce air losses that prove tremendously expensive.

Examine this typical diagram that points out many common sources of losses—both in money and in accuracy.



1. WARPED STRIPPER FRAME
2. WORN PIN PILOTS
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4. WORN GUIDE PINS AND BUSHINGS
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6. JOLT CYLINDER AND PISTON
7. SQUEEZE CYLINDER AND PISTON

If you have machines with long production records, you can be sure many parts are extremely worn. Their efficiency is going down month by month.

We can rebuild them for you to their original production status. Don't you think you'd better look into this now, and save yourself a lot of money?

Standard Pattern Works

MACHINE DIVISION

13781 CONCORD AVENUE • DETROIT 12, MICHIGAN

(*Concluded from page* 194)

Works Inc., Curtis Bay, Baltimore, will discontinue use of that name and conduct all future activities under the title Mathieson Chemical Corp.

* * *

Standard Pattern Works, Machine Division, Detroit, formerly at 6771 East McNichols Rd., is now located at 13781 Concord Ave. The move has provided the company with new facilities for rebuilding all types of metalworking machines. C. H. Miller is president of the corporation.

* * *

Combined volume of shipments of ingot brass and bronze, as reported by the Ingot Brass & Bronze Industry, Chicago, was 14,550 tons for March, 1949, compared with 15,026 tons for February and 24,282 tons in March, 1948.

* * *

Grapho Products Inc., Lawrence, Ind., lost one of its two buildings in a recent $100,000 fire.

WHAT MAKES A GOOD FOREMAN?

(*Continued from page* 91)

the unjustness of company policies." You will probably agree that none of your company's policies are formulated with the idea of purposefully trying to antagonize the employee. Personally I can think of very many cases where my company, through its officers, have leaned over backwards to do employees a good turn. Unfortunately, a small irritant felt by a large number is remembered far longer than the good things that are more individual.

Then there are those things that can be placed under the heading of "Poor Management." And these points can take many forms in the eyes of the employee. They include, first of all, *tactless discipline;* for instance, this business of humiliating a man in public. Humiliation in private is bad enough, but in public if a man doesn't stay humiliated, he will most likely rebuild his self respect at your expense.

Then there is *favoritism and discrimination.* The unionized company will realize that one is illegal if practiced on a number of the collective group. Yes, one has to be careful, but if management is fair, it can forget to be careful and just act naturally.

Unbusinesslike methods form another ripe source for dissatisfaction. If workers see slipshod routines be-

(*Continued on page* 198)

Are you on the right track?

Today foundry practice demands low operating costs. Are you on the right track? Take the road that leads to substantial savings... reclaiming used sand—sand that looks like new... works like new... the "Nichols way"... at a cost far below new sand.

Reduce sand shipments.

Eliminate sand disposal costs and problems.

Nichols equipment is broad enough in design and modifications to bring it well within the range of every foundry.

Nichols engineers will be glad to review your sand problems and offer sound, practical suggestions or complete plans.

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(*Continued from page* 196)

ing performed, or condoned, management is going to lose face in the eyes of the worker. If the condition adversely affects the worker, then he is going to complain.

The next is *uneven distribution of work* where some workers get all the disagreeable jobs, or some certain few get all the overtime.

Passing the buck between departments; not just a matter of inter-departmental rivalry, but inter-departmental banditry.

And lastly that attitude of "Do as I say, not as I do," practiced by many in supervisory positions, and I do not confine this to foremen.

Then there are the points on *poor working conditions:* Temperature, ventilation, poor housekeeping, inadequate safety conditions, inadequate lighting, unfavorable comparison with other departments, poor tools.

Respect the Worker's Right

Many of these points listed under poor management and poor working conditions are included in another major reason for discontent, "Disregard for the worker's right." Now, all men expect and deserve justice. They have a right to expect it for themselves and their fellow workers.

As we consider all these points it is obvious that even the foreman can't clear them all. But more than anyone else, the man who is in the best position to deal with them is—the foreman.

When workers are dissatisfied with their jobs it is generally apparent if the trouble is taken to notice it. They are evidenced in many ways, probably the most common being: lack of co-operation; grumbling, constant complaint; argument, friction, open dispute; jealousy; absenteeism and lateness; gossiping; disregard for rules, lowered production.

We have spoken of what men want from their jobs, some of the reasons they do not get it, and what their reactions are likely to be. The question now is, "What can the foreman do about it?" The answer is simply to apply good foremanship and leadership, which includes: Fair and just supervision. Knoweldge of the individual worker. Make a point of talking to them. Ask them how they are making out on their jobs. Give them an opportunity to tell if there is anything wrong. Be willing to discuss it with them. If a subject needs a follow-up—do it.

Encourage discussions of the workers' troubles. Don't promise what you can't deliver. Maintain a safe department. Insist on the use of guards and other safety measures. Keep the workers informed on reasons behind company policies. Respect the individual worker as a human being. Give credit where credit is due. Treat your workers as you would like your superior to treat you.

People being what they are, and our dealings with them being something less than perfect, we still have situations that cannot be settled without recourse to the grievance procedure.

Just what is a grievance? A grievance is a state of dissatisfaction existing in the worker, expressed or unexpressed, caused by some condition that has an annoying physical or mental effect. When the worker has a grievance, real or imaginary, a maladjustment exists.

Grievances are not always expressed openly. Sometimes the only evidence that a foreman may have of the existence of a grievance is through a change in attitude or lowering of morale among his men. They may be imaginary. However, whether the grievance is real or imaginary, expressed or not, written or unwritten—to the worker it is real and important. It is a situation which must be adjusted if the worker is expected to continue to give satisfactory performance.

The worker's personal problems are important to the foreman. They affect performance. They are production problems. The troubled worker cannot put forth his best efforts. Permitted to lie dormant they may turn the best worker into a trouble maker. Most foremen have, at one time or another, experienced the following types of problem workers with undesirable personality traits which cover a broad range. Some of them are: The non-cooperator, the agitator, the "short-circuit" man, the "buck-passer," the skilled but indifferent worker, the chronic invalid.

Many sources of dissatisfaction are responsible for tense situations. They are often connected with the foreman, the worker himself or the environment.

Problem foremen we have already discussed. The employees too can have defective dispositions. There are some who wear a constant chip on their shoulders, they are ready for a scrap any time. They will make the worst of any slight, fancied or otherwise. Some are so emotional that their nerves go haywire at the slightest provocation. Some feel themselves superior to the type of work they are called upon to do. Others are just plain incapable of doing their jobs.

It is a fact that many grievances, written or verbal, do not state the real causes behind them. This is especially true when the grievance is of a personal nature against the supervisor or other workers. The worker may complain about everything except the real cause. If a foreman discovers a possible source of grievance and voluntarily corrects it, his action will be more appreciated than it would be if he took the same action after having had a complaint made by his men.

Foremen Should Merit Trust

Workers who have confidence in their foreman's fairness and interest in their personal welfare are most likely to take their problems to him. This is an ideal situation and most of such grievances are settled at the discussion level. The foreman who is never aware that a grievance exists until presented with a written complaint should very carefully analyze his relationship with the workers. It indicates a bad situation which is likely to be entirely personal. This may be caused by:

1. Lack of confidence in his interest in their problems, or of his fairness, the grievance being either a means of forcing action or of getting the problem into the hands of others.

2. Failure to act promptly or fulfill promises. Most labor agreements provide a time element in which a written grievance must be answered. In the case of verbal grievance, however, it can happen so easily that the foreman considers it to be very trivial. He says he will look into it or he will see someone about it, then forgets. The employee doesn't forget; in fact, he is liable to think that the foreman definitely promised to remedy the situation and has done nothing about it.

3. Lack of personal contact with

(*Continued on page* 200)

Jack in the Box

Foundry workers at the Newnam Foundry Co., Kendallville, Ind., were astonished recently when they opened a box of core sand and out popped a man. The unidentified character just dusted himself off and walked away, while his liberators stood around with jaws hanging loosely. He refused to say how he got there, or why, or how he had been making out. All the foundrymen could find out was that the box of sand had been loaded on a box car four days previously in Muskegon, Mich., and hadn't been opened until it arrived at Newnam Foundry.

Hercules TRULINE BINDER *Cuts Core Room Losses*

IN STEEL FOUNDRIES
using Silica Flour, Bentonite, or Fireclay...

- "TRULINE" REPLACES CORE OIL
- MAKES MORE UNIFORM CORES
- GIVES SAME PHYSICAL PROPERTIES
- UP TO 25% FASTER BAKING
- SOUNDER, TRUER CASTINGS

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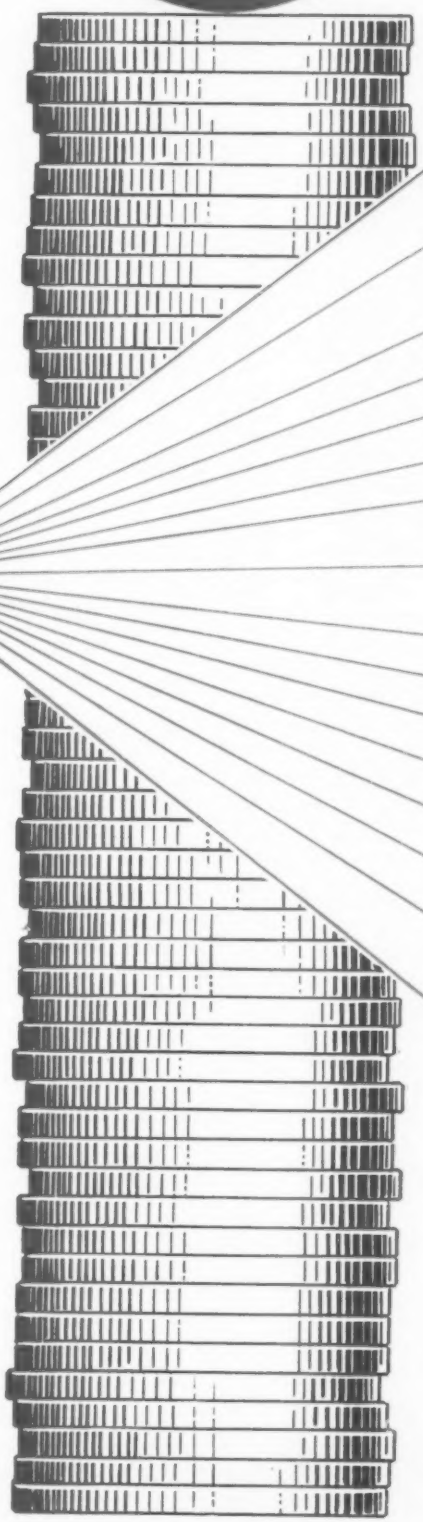
- "TRULINE" ELIMINATES PITCH
- GIVES STRONGER-HANDLING CORES
- EASIER-COLLAPSING CORES
- UP TO 50% LESS CLEANING TIME
- FEWER CRACKED CASTINGS
- CLEANER CASTINGS
- ELIMINATES SCABS



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(*Continued from page* 198)

the workers. Thus no opportunity is given the workers to present their problems personally.

4. Quite often the worker who has a problem or grievance merely wants a chance to be heard. He wants to get something "off his chest." As many people do, he wants to be "listened to." The foreman who must do all of the talking does not have many workers coming to him with their problems.

5. The foreman who loses his temper can't talk back very much at a grievance form. "If you are right, you can afford to keep your temper. If you are wrong—you can't afford to lose it."

Fundamental Principals

When negotiating a grievance several very important fundamentals must be emphasized:

1. Regardless of the nature or unreasonableness of the complaint, every grievance must be considered as being very real and important to the worker involved. The foreman cannot create confidence in his men except as he demonstrates a sincere, personal interest in their problems. That confidence has a great deal to do with the acceptance of grievance settlements at the foreman's level.

2. The best method of handling a grievance is to handle it at the discussion level—before it becomes a written statement. In other words, keep it out of the grievance procedure.

3. The worker who has a grievance filed is already convinced that he has a just claim.

4. Many statements of grievance do not state the real grievance.

5. A grievance that has entered the written stage represents a dispute over the value and relationship of certain evidence to a statement of grievance or claim. The statement of a grievance represents a conclusion drawn by someone, from evidence or conditions which he believes justify that conclusion.

With these thoughts in mind remember that the settling of a grievance is no different from settling any other problem. The first thing that must be done is to get the facts. Make sure that the statement of grievance clearly states and represents the complaint or grievance. If the statement is ambiguous, take care that the workers rephrase it so that a mutual understanding will be reached. If it must be restated have new form filled out, making certain that the old forms are destroyed. The statement of a grievance is the same as the statement of a problem. Don't try to solve it unless it is clearly stated and understood.

Meeting Calendar

June 2-4—Electric Metal Makers Guild Inc., annual meeting, Bismarck Hotel, Chicago

June 9-10 — Steel Founders' Society of America, industrial relations meeting, Drake Hotel, Chicago

June 16-17—Malleable Founders' Society, annual meeting, Homestead Hotel, Hot Springs, Va.

June 27-July 1—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 30-July 1—American Foundrymen's Society, chapter chairmen's conference, Chicago

July 28-29—American Foundrymen's Society, annual directors meeting, Chicago

Sept. 12-16—Fourth National Instrument Conference and Exhibit, sponsored by Instrument Society of America, Municipal Auditorium, St. Louis

Oct. 7-8—New England Regional Foundry Conference, sponsored by New England Foundrymen's Association and Massachusetts Institute of Technology, MIT, Cambridge, Mass.

Oct. 10-14—American Society for Testing Materials, Pacific Coast meeting, Fairmont Hotel, San Francisco

Oct. 13-14 — Steel Founders' Society of America, fall meeting, Ambassador Hotel, Los Angeles

Oct. 13-15—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

Oct. 17-21—American Society for Metals, metal congress and exposition, Public Auditorium, Cleveland

Oct. 24-28—National Safety Council, 37th National Safety Congress and Exposition, Chicago

Oct. 27-28—Gray Iron Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago

Nov. 3-5—Meehanite Metal Institute, annual meeting, Hotel Carter, Cleveland

Nov. 10-11 — National Foundry Association, annual meeting, Waldorf-Astoria Hotel, New York

Nov. 15-16 — Michigan Regional Foundry Conference sponsored by the Michigan AFS chapters, Michigan State College, East Lansing, Mich. (Tentative)

Nov. 25-26 — New York Regional Conference, sponsored by New York AFS chapters, Syracuse University, Syracuse, N. Y.

1950

(Tentative Schedule)

Feb. 8-9 — Steel Founders' Society of America, annual meeting, Edgewater Beach Hotel, Chicago

May 8-12—American Foundrymen's Society, annual convention and exhibition, Cleveland

Oct. 12-13—Foundry Equipment Manufacturers' Association, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

Oct. 19-20—Gray Iron Founders' Society, annual meeting, Netherland Plaza Hotel, Cincinnati

Nov. 8-10—National Foundry Association, annual meeting, Edgewater Beach Hotel, Chicago

For every grievance, it must be assumed that there is evidence to support it. Unfortunately, many grievances do not state the reasons for the claim. Here again, the job is one of getting facts. If the reasons are not given, find out from the person who filed the grievance what evidence is claimed. Make notes during the discussion. Adopt the "questioning" attitude. Constantly test the validity of the relationships of the evidence to the stated claim.

Listen carefully. Analyze carefully. The fellow who does all of the talking usually learns nothing more than he already knows. Therefore, in dealing with grievances, one must:

First, have a clear understanding of the nature of the grievance.

Second, get the evidence which is claimed to support the grievance.

Third, make a "point by point" analysis of that evidence for its relationship and value to the claim made.

Fourth, do not investigate evidence that has no bearing on the grievance. Such evidence may be important to other things, but not to the claim made. The foreman who investigates evidence unrelated to the grievance often finds himself committed to the assumption that it has importance in the settlement.

Fifth, adopt the questioning attitude. A question can be neither right nor wrong. An answer can. You get more information by asking questions. *Get the habit of "listening".*

If the evidence claimed is factual —that it exists—then the claim made is justified. The next step, therefore, is to make a thorough check for the existence of the condition claimed in the grievance. Most grievances are weak on this point. Handling grievances that get beyond the first step usually becomes a matter of finding facts which could have easily been determined in the first instance. Therefore, make a thorough investigation. *Get all of the facts.*

Make Decisions Carefully

After all of the facts have been gathered, don't be hasty in making a decision. Carefully weigh the facts. Constantly keep the claim or statement of the grievance before you. The solution to any problem is an entirely impersonal matter. Remember, "the rightness or wrongness of a situation has nothing to do with your will or my will but is something that is inherent in the situation itself."

After going through the foregoing steps, be prompt in your action. Grievances which are "dragged out" may become moral, face-saving issues and can develop into serious situations. Often the worker interprets delay as the only defense against his claim.

In all that has been said, make plenty of notes—and keep them. Attach a copy to your copy of the grievance. Verbal agreements or discussions are sometimes easily forgotten. Remember that those who must handle it beyond the first stage are less familiar with the situation than you.

Every foreman has access to other areas of management where he can get help on grievance matters. If it is one that affects company policy, labor agreements, etc., consult with others before making a decision. Even though a foreman gets help

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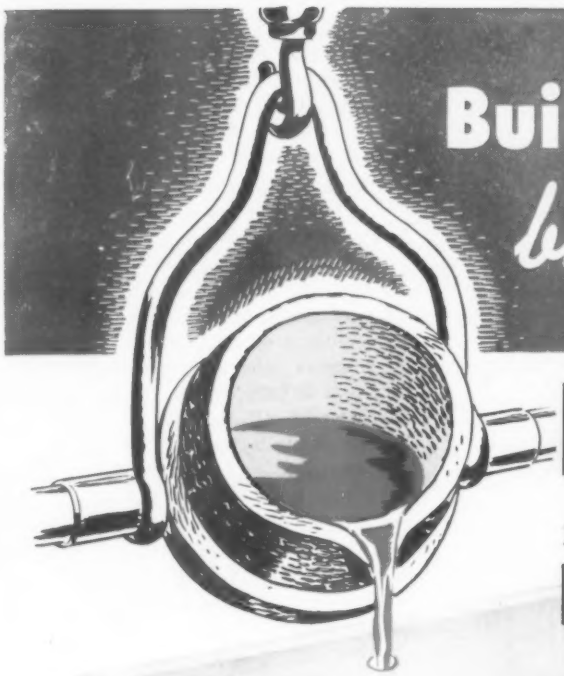

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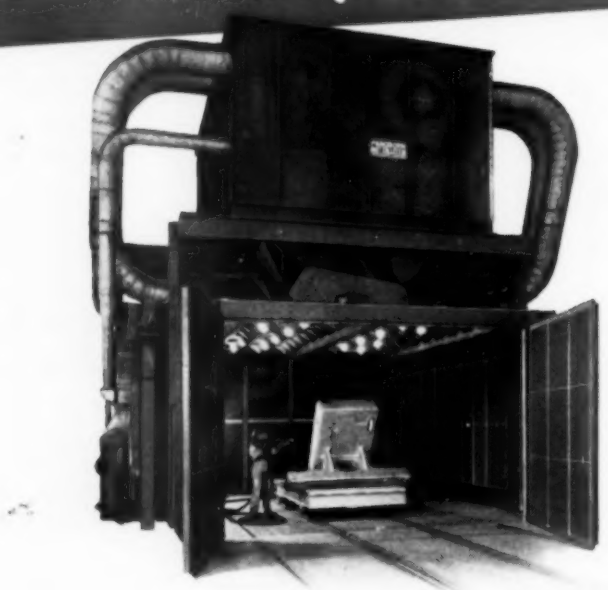

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(*Concluded from page* 200)

from others in answering a grievance, he must still accept full responsibility for the decision. It should be stated as his decision and not as that of others.

Avoid referring the responsibility for certain decisions to others. The foreman should refrain from making such statements as "this is a matter of company policy, etc." The decision may be stated on the basis of policy, etc., with a statement of the policy or reasons wherever necessary. The foreman is responsible for the administration of all matters of labor relations at his level.

Reversal of a foreman's decision at a higher level does not necessarily reflect on the soundness of that decision. Where large issues are at stake, it may be expedient in the course of collective bargaining to give in on one issue while standing on another. Top management is thoroughly aware of this condition and does not think any the less of a first-line supervisor for holding to a position that might later be changed through expediency.

Decisions Cover Wide Scope

We should realize that top management examines a grievance from different angles. It must ask, "How does this line up with company policy? Is it liable to have adverse public relations effects? What effect will it have on other related cases."

Foremen and other levels of supervision often express the opinion that with more and more specialized staff departments, time study, inspection, manufacturing methods, production planners, and also with unionization, their jobs are not as important as they were before all these frills were added. I grant that the position is not the same as years ago when the foreman was monarch of all he surveyed, a little tin god; but I am quite positive that more than ever before, on the leadership and co-operation shown by the foreman depend the efficiency and attitude displayed in their departments.

Remember—the foreman is a member of the management group, he is more than a representative who interprets the worker to management and management to worker. He is that part of management through which the interpretation of both management and worker must flow. One of the most important elements of his task is to properly deal with the workers under his supervision so that the most effective work results with the least possible friction and irritation.

If he can deal with all these points effectively, he is a good foreman.

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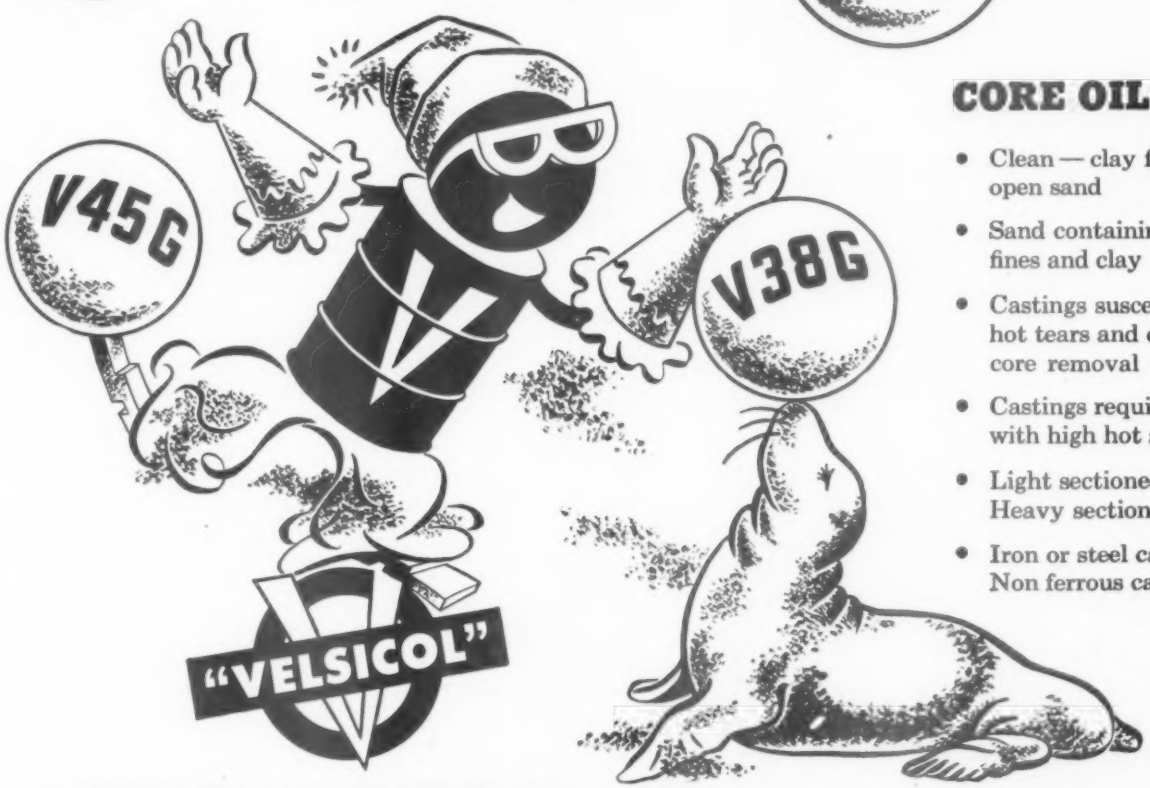

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By PAT DWYER

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ADVENTURES OF Bill

THE soft, mellow notes of a church bell from some place in the vicinity came floating in one evening recently to where Bill and I sat on the veranda engaged in a favorite occupation of doing nothing. After a period of peaceful quiet, Bill remarked that the sound of a bell stirred up the memory to a greater extent than any other feature in the long list of memory revivers. Certain sights, sounds, and particularly odors, never failed to bring vividly to mind, events and incidents from an otherwise dim past, but the sound of a bell blotted out time and space in the most remarkable and perfect manner.

"Well," I admitted, "bells have been mixed up with the activities of the human race about as far back as any record exists. However, a few shakes from the salt cellar might be applied with profit to some of the popular tales, legends and traditions. For instance, a poem entitled 'Curfew Shall Not Ring Tonight' has enjoyed wide popularity for years and years, despite the fact that the incident is utterly and physically impossible. Even as a boy, with a boy's traditional appetite, I could not swallow that one."

"I know the one you mean," Bill said. "A beautiful young lady named Bessie bewails the fact that her fella is in the jug for some offense. Nature of offense not specified. Must be something worse than speeding or illegal parking. That night when the curfew rings, he is to die. Bessie, of course, does not think so highly of the court which issued the sentence. She approached the old bell-ringing sexton, and tried to persuade him to omit ringing the curfew that night. In her dopey mind she figured that if the bell did not ring, the jail gang would not string up the hero. The old boy was pleasant and friendly, but regretted he could not change the routine. For half a century, or some such incredible period, he had rung the curfew bell every night. He could not make any exception in Bessie's favor. Fortunately, Bessie knows the old bell ringer is as deaf as the traditional post. She decides to muffle the bell.

"In the good old days, when all this is supposed to have happened, the heroine had an infallible remedy. Any time the hero lost a leg or an arm or had his head split open with a tomahawk, she rushed in, gathered him in her arms and begged him not to worry. Everything would be ALL RIGHT. Turning her back modestly for a moment, she lifted her skirt approximately knee high, and then tore off a yard, or maybe a yard and a half, from one of her numerous—ah—petticoats. You should try it some time. The feat is in the same general classification as the exhibition occasionally put on by one of those gifted individuals who tear a big, fat telephone directory in two with the bare hands. The lady returns and winds the warrior up in the improvised bandage. In practically no time he is as good as ever with a new leg or arm sprouting from the old stump, or with the two halves of the old knob stuck neatly together.

"With all this common knowledge, and presumably with the standard number of petticoats, you would think she would have decided to muffle the bell by wrapping part or all the garment around the clapper. Apparently Bessie was a member of that class whose intention is good, but who do every job in the hardest possible way. She decided to grab the clapper with both hands, swing back and forth and allow her hands to bang up against the inside of the bell. Just put yourself in her place. Could you do it? Ha!

"Le's see. How does the last verse go: 'O'er the distant hills came Cromwel!; Bessie sees him and her brow, full of hope and full of gladness, has no anxious traces now. At his feet she tells her story, shows her hands all bruised and torn; her face so sweet and pleading, yet with sorrow pale and worn, touched his heart with sudden pity—lit his eye with misty light; 'Go, your lover lives!'

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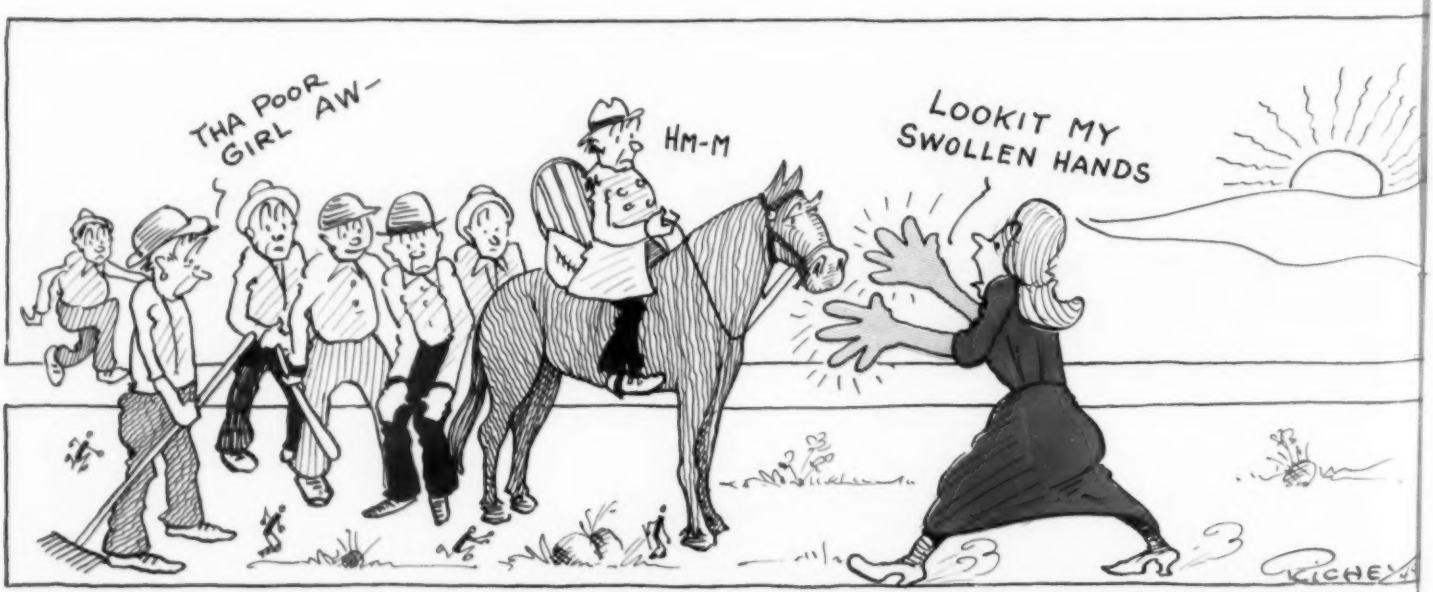
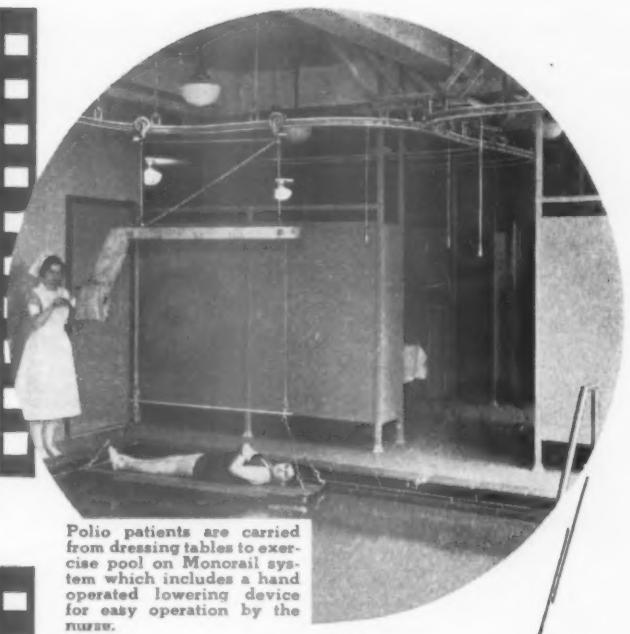


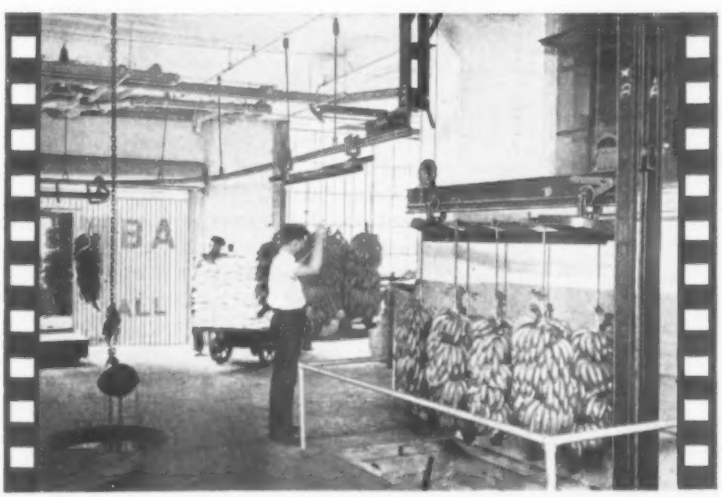
"OK" says the jolly old Oliver. "If that's what you want. Now all together boys, Cur-r-r-few Shall Not R-r-r-ing Tonight"

Another demonstration of the MonoTractor drive includes a swinging jib for passage of the carrier over a truck for removal of 2 ton bundles of sheet steel. An electric hoist and a Windsor sheet grab are used.



Polio patients are carried from dressing tables to exercise pool on Monorail system which includes a hand operated lowering device for easy operation by the nurse.

This twin-bridge 5 ton crane is 160 feet long operating on 9 runways. Two carriers, each centered between a pair of crane trucks, can make a lift of 10 tons as shown.



Fruit, unloaded from cars on special trolley racks, rolls around MonoRail curve to a drop section where the racks are lowered to basement tracks. The racks then roll by gravity to ripening rooms.

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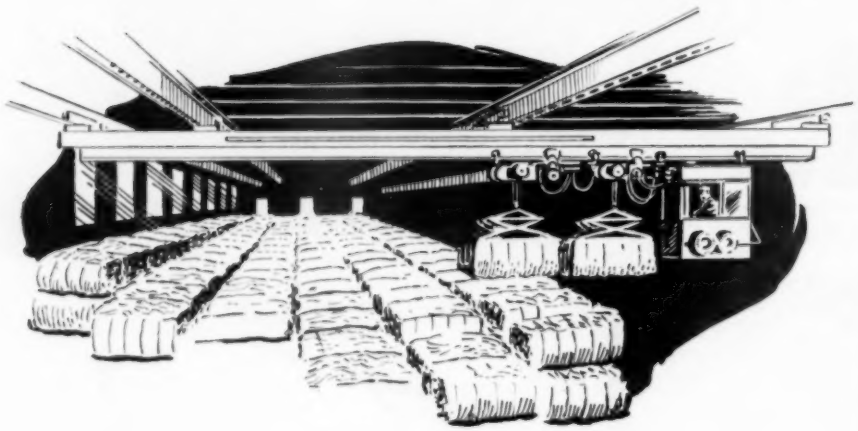

Stacking rolls of paper stock for storage with a "through the air" movement has lowered handling costs and produced more solid stacking in the storage area.

This warehouse picks up the loads *at the door* with overhead equipment, specially designed by Shepard Niles to operate with minimum headroom. No aisle space or turning radii are needed, every cubic foot of area is used for stacking "from the air."

This is one example of the service Shepard Niles specialists can supply to those with materials handling problems. There is economy in knowing where to leave off with one method and take up with the cheaper, faster, safer, "through the air" movement.

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(*Continued from page* 204)

said Cromwell; 'curfew shall not ring tonight!' A likely story. Hey?"

"Purry good," I admitted, "purry good. Your memory is better than I thought it was."

"Well," said Bill, "I'll tell you. At a party one night where we were all in the 18-20 year class, I heard a girl reciting the thing in a manner which showed her views and mine coincided exactly. I could not match her performance, but I could, and did, appreciate her ingeniously fiendish presentation.

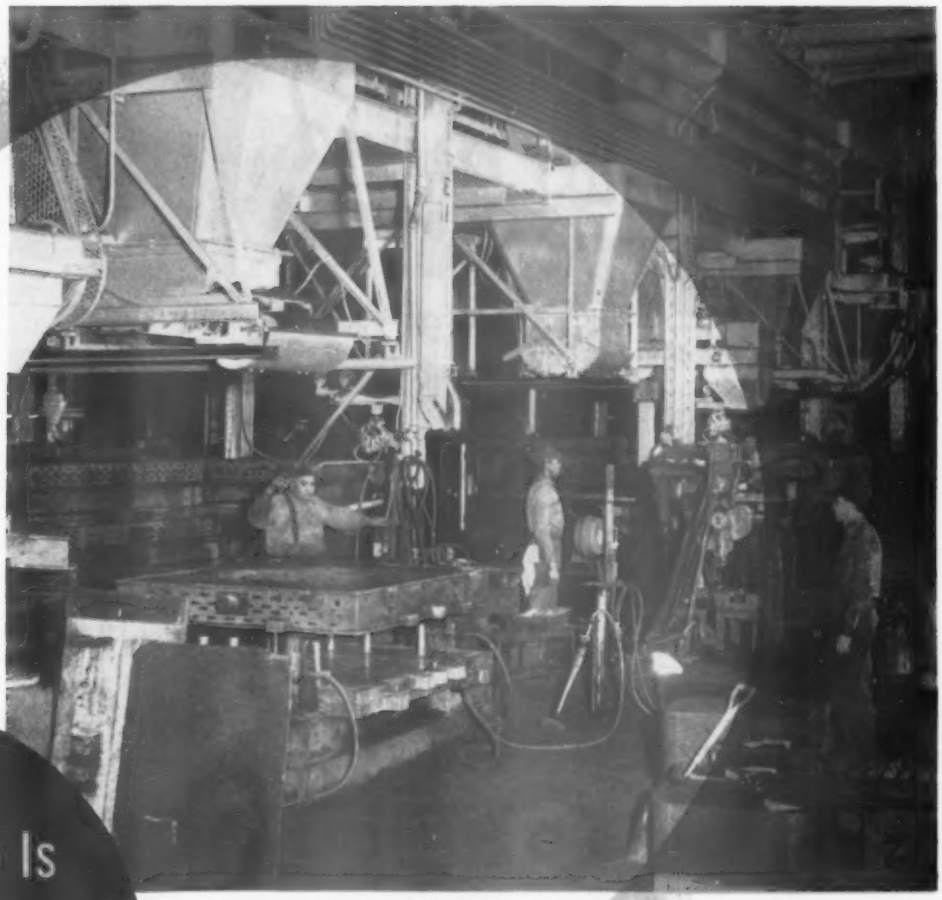
"According to a well known tradition, one or two fairies always are kind of hanging around at every birth. If they are in particularly good trim, they endow the baby with one, and sometimes two, gifts which remain with the baby all through life. In this instance the girl developed a voice with almost as wide a range as that of Gracie Fields. She could imitate any person. What is more to the point she cultivated this gift to a high state of perfection.

"At a concert the night before, a serious-minded young lady had delighted one and all with a rendition of 'Curfew Shall Not Ring Tonight.' Tears hopped freely from the eyes of the tender hearted. Young men clinched their fists, breathed hard, and wished they had a chance to take a hand in the general proceedings. The young lady gave the thing the whole works with suitable gestures. After the manner of practically all women who speak in public she used an affected tone of voice and leaned heavily on the broad *A*. This was what was known in our day as talking proud. She also juggled the letter *R* in a most remarkable manner. For example, the word 'war' became 'waw' while 'saw' and 'idea' and other words of a similar nature became 'sawr', 'idear,' etc. All these features lent themselves readily to a burlesque presentation. The imitator did the thing in a manner that fairly curled us up in delighted admiration. Do you want me to give you a verse or two?"

"No," I said, "I think I have heard about as much curfew as I can stand for one night. What have you heard lately from our own firing line? Have any of the boys cheerfully dumped a more or less mysterious problem in your lap?"

"Well," said Bill, "that is rather a curious coincidence. As a matter of fact, I had an inquiry recently from a citizen who informed me that he was not a foundryman. He was an engineer. Recently a problem involving certain foundry features devel-

(*Continued on page* 208)



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(*Continued from page* 206)

oped in his plant and he was the lad selected to find the answer. After turning the thing over in his mind a few times he wrote to me. I have it here some place in one of my pockets. Ah! Here it is, listen:

In a recent issue of THE FOUNDRY, several references are made to dry sand molding. Apparently this subject was discussed in former issues which have become mislaid or lost. I should like very much to have these articles, also any other references that have appeared on the subject. We are primarily interested in quality castings rather than quantity within an economical ratio. We cast only nonferrous metals in small job lots, 50 to 100 pieces ¼ to 5 lb. Patterns are matchplates, or loose patterns on match boards. The molds are hand rammed. We are wondering whether a small squeeze jolt machine would be of assistance.

The old sexton says "Naow"

"I read this over several times," Bill said, "but I could not get a proper grip on the meaning. I wrote the citizen for a few gleams of light in the dark corners, as follows:

"Dear Sir, and so forth. A second perusal of your recent letter seems to indicate that you are thinking of stacked molds instead of dry sand molds. As with practically every trade, profession or calling, the foundry industry has its own nomenclature. Dry sand molding refers to a method in which the entire mold is made in the ordinary manner from molding sand in a flask and then dried in an oven. Where a mold is made in core sand with or without a flask, it is termed core molding. Where several cores are built into a horizontal or vertical stack, the process is known as stack molding. The process is not

(*Continued on page* 210)

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(*Continued from page* 208)

confined to cores baked in an oven. In many instances green sand molds in shallow flasks are stacked eight or ten high and poured as units in that position.

"Of course the object in any instance is to increase production on any given floor space. The number of flasks also is reduced, since the bottom face of one mold section serves as the cope face for the drag immediately beneath. I do not think that stack molding would be of any particular advantage in your case. Presumably you are not cramped for room. You can spread your small number of molds on the floor. The stack system is only of special advantage where one side of the mold is perfectly flat.

"Five different methods of stacking molds were described in The Adventures of Bill, July 1, July 15, Aug. 1, Aug. 15, Sept. 1, 1924. Three methods were described in considerable detail comparatively recently. 1—Large flat cores containing an impression of a flat counterweight casting, stacked 5 high, February, 1948, page 76. 2—Green sand molds in flasks piled 6 high, containing plow points, May, 1942, page 100. Each mold was complete with cope and drag. One did not serve as cope for another. Each mold was poured independently. The first mold rested on the second, but projected over the back end a few inches to leave the sprue clear in the first. Nos. 3, 4, 5 and 6 were stacked in a similar manner. Metal was poured first into the lowest sprue. Then the ladle, suspended from a monorail was raised in succession to the other molds. 3—In this method, March, 1943, page 88, piston ring molds were made in green sand, in shallow flasks and stacked ten high.

"In the last method the drag face of each mold was the bottom face of the flask section immediately above. The mold cavity or cavities was or were in the bottom face of the cope. In a fourth method practiced in a steel foundry, a number of flange molds on edge are bound into a unit with straps and bolts. One sprue serves the group. A large riser on the upper edge of each feeds each casting. Possibly one of the foregoing methods might serve you to advantage. Character and shape of your castings should decide that point. A small molding machine would be a worthwhile addition to your shop equipment, but its value would depend on its constant use. Idle machines do not pay dividends in the foundry, or elsewhere.

(*Concluded on page* 212)

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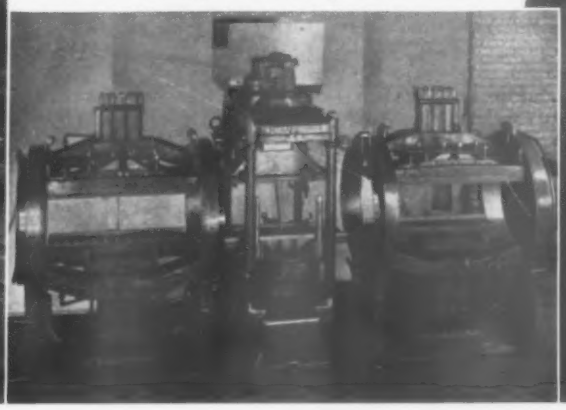

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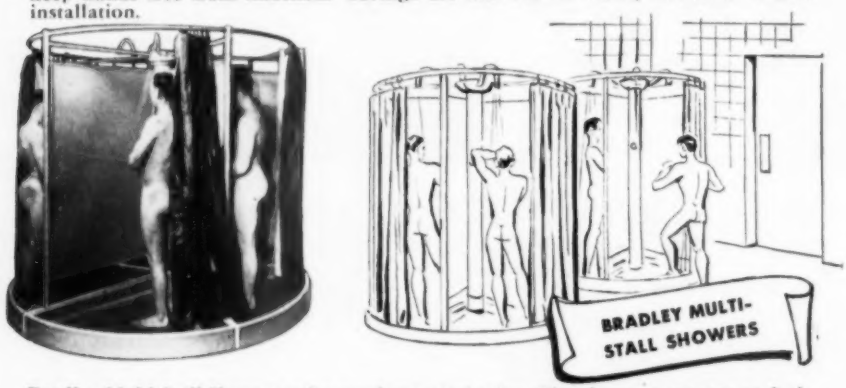

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(*Concluded from page* 210)

"With the exception of the core molds which usually are held together by clamps, the stacked molds are weighted on top with various types of flat weights. However, the work of the weight shifters is minimized. Instead of placing a weight on each mold, only one weight is required, for each stack. The copes of all the molds are held in place by the molds above them. Thus only one weight is required for the top mold in the stack. Where the molds are assembled in a straight stack, the sprue usually is in the center of the top cope and extends in a straight line to the bottom. One or more gates at each joint conduct the metal into the mold cavities. Where molds are stacked in step formation, that is with part of each mold projecting over the mold immediately beneath, the sprue for each mold may be close to one side or one end of the flask. In some instances special flasks are provided with a projecting pocket at one side or one end."

GRAPHITIZATION IN MALLEABLE IRON PROCESS

(*Continued from page* 90)

nuclei.

2. The activation of such nuclei.

3. The solution of cementite in austenite.

4. The diffusion of carbon from the carbide phase towards the graphite nuclei.

5. The crystallization of graphite on these nuclei.

To understand the above phenomena it is obviously necessary to determine the mechanism of cementite breakdown and then to follow the effects of various elements upon the mechanism.

Many investigators have approached this problem by a consideration of the heat, entropy, and free energy changes accompanying the reactions. These investigators have, in the main, obtained conflicting results.

Much more positive evidence has resulted from a close study of the fact that graphite of approximate density 2.3 is replacing cementite or iron of much higher density. Provided that due account is taken of the changing density of the metallic matrix due to the removal of carbon, it is now established that the resultant expansion is proportional to the amount of graphitization.

(*Continued on page* 214)

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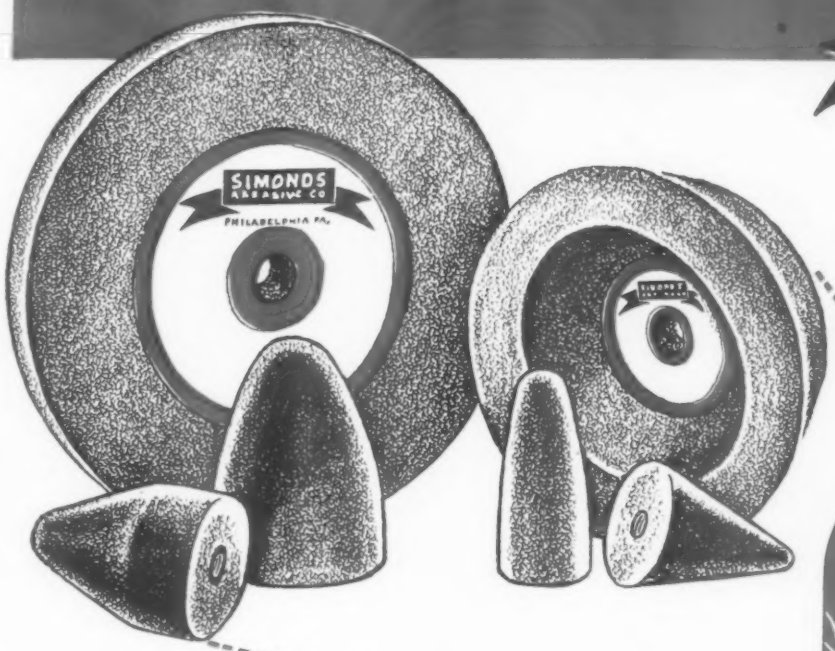

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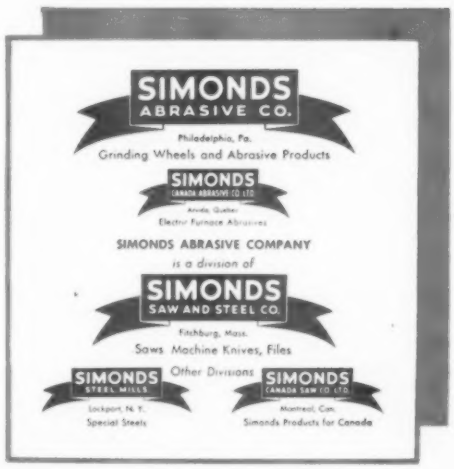

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... "top shrinkage" is eliminated—no soldering to build up depressed areas.

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... with only a trifle less linear shrinkage than other aluminum alloys, no change in the pattern scale for running No. 12 Alloy is needed.

... checking is rarely encountered.

WRITE FOR COMPLETE DETAILS

NIAGARA FALLS
Smelting & Refining Division
Continental Copper & Steel Industries, Inc.
BUFFALO 17, NEW YORK

(*Continued from page* 212)

Using the foregoing facts, Palmer[1] in the laboratories of the British Cast Iron Research Association has evolved a comparatively simple dilation apparatus enabling graphitization time curves to be obtained. We are thus able to measure accurately the speed of the graphitizing reaction and to compare various compositions.

A significant difference was noted between the curves obtained from iron graphitizing with the spherulitic nodules and iron graphitizing with the flake aggregate nodules. Examples are shown in Figs. 7 and 8.

When graphite forms as flake aggregate nodules the curve has the form shown in Fig. 7. If, however, graphite forms as spherulitic nodules, the curve has the distinctive form shown in Fig. 8. The portion *A B* on this curve represents a period of time during which little or no expansion occurs. In other words, little or no graphite forms. This portion is aptly termed an incubation period. Point *B* represents the beginning of graphitization and Point *C*—where the curve flattens out—the completion of graphitization.

At Point *C* the peak of expansion is reached indicating that practically all cementite has been decomposed and equilibrium for the temperature chosen, achieved.

Graphite/time curves obtained from compositions suitable for the production of blackheart are typified by Fig. 7 and show little or no incubation period. Fig. 8 is typical of curves obtained from the cementite decomposition in white irons of whiteheart composition.

Structure of Graphite Nodules — Reference has been made to the occurrence of the spherulitic type of nodule and to the flake aggregate type of nodule, and also to graphite/time curves of two distinct types. We are indebted to Morrogh[2] for establishing beyond doubt that in irons containing the sulphur predominantly as manganese sulphide, graphite forms as flake aggregate nodules. Fig. 3 shows a typical example. He also demonstrated, convincingly, that when iron sulphide (FeS) is present in the iron at the annealing temperature, graphite nodules occur in the spherulitic form, as in Fig. 2.

The graphite/time curves indicate that the mechanism of graphitizaton for the two forms is quite different. This surely means that the fundamental difference between blackheart and whiteheart lies in the mode of

(*Continued on page* 216)

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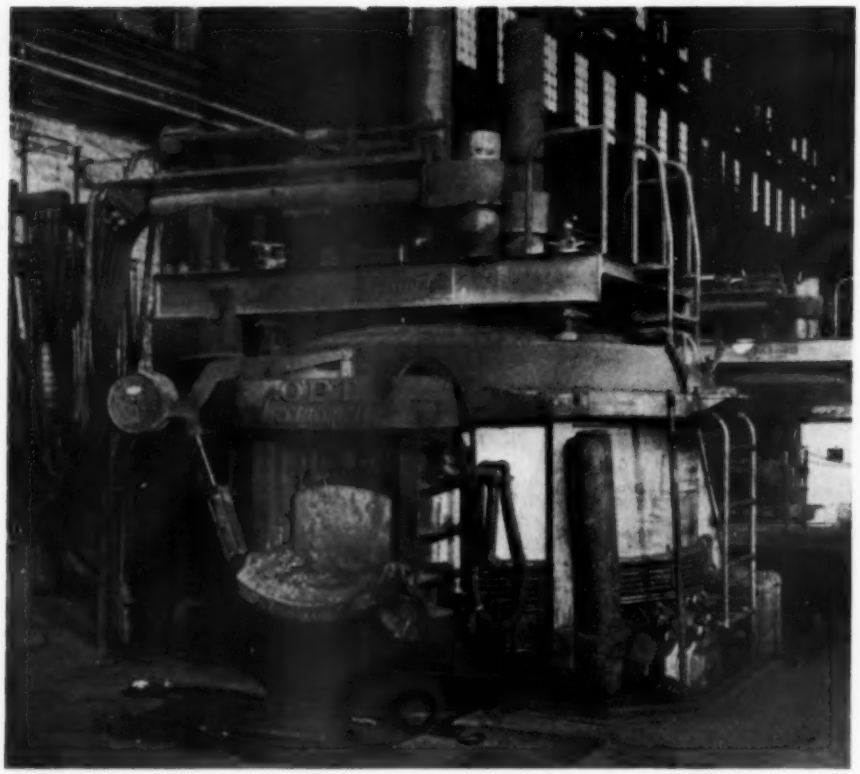

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(*Continued from page* 214)

occurrence of the sulphur, rather than in the carbon-silicon ratio, annealing temperatures, or the atmosphere surrounding the white cast iron during annealing.

Further confirmation of the above has been obtained, following the examination of many specimens of malleable cast iron, at the British Cast Iron Research Association. This has revealed that many spherulites have a particle of iron sulphide or iron sulphide rich material in the center of the nodule. Fig. 12 illustrates a typical example.

The conclusion has been reached that, although for practical reasons it has not been possible to demonstrate that every spherulite contains a nucleus of iron sulphide, there is a high degree of probability to this effect. Examples can also be found indicating that flake aggregate nodules form around manganese sulphide particles, a fact reported by Schwartz.[4] An illustration of flake aggregate graphite forming around a crystal of manganese sulphide is shown in Fig. 9.

The above facts have led Morrogh to suggest that some of the sulphide particles function as nuclei and that the crystal structure of these nuclei influence the mode of crystallization of the graphite. Manganese sulphide has a cubic crystal structure and iron sulphide a hexagonal crystal structure.

Schwartz[5] has demonstrated that for irons giving the flake aggregate nodules, graphite first appears at a cementite austenite interface. It has now been established that for irons giving nodules intermediate between those of the spherulitic and flake aggregate, and for true spherulitic structures, that graphitization begins at the cementite austenite interface.

Fig. 1D shows graphite commencing to form after 20 hours at 930°C in an iron containing 0.12 per cent manganese, and 0.32 per cent sulphur.

The conclusions of Schwartz and Morrogh appear to be related as the sulphide particles naturally tend to be located at the cementite austenite interfaces.

Manganese-Sulphur Ratio — It is obvious from the foregoing that the relationship between manganese and sulphur is of immense importance in the graphitizing reaction, and of practical significance in the production of malleable cast iron. This relationship is usually represented by the reversible reaction, $FeS + Mn \rightleftharpoons MnS + Fe$. The reversibility is re-

(*Continued on page* 218)

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(*Continued from page* 216)

sponsible for the frequently stated fact that in order to neutralize all the sulphur as manganese sulphide it is necessary to have an excess of manganese over the theoretical percentage indicated by the formula (MnS). Additions of manganese cause the reaction to proceed to the right, additions of sulphur to the left.

The effect of temperature is important; with increasing temperature the reaction tends to proceed to the left, with a decrease in the concentration of manganese sulphide and an increase in the concentration of iron sulphide.

Produced Equilibrium Diagram

The work of Shibata[6] is a noteworthy contribution in the above connection. Shibata produced an equilibrium diagram for the partial system FeS—MnS and found that the system gave a simple binary eutectic of two solid solutions at 93.5 per cent iron sulphide and 6.3 per cent manganese sulphide at a temperature of 1164°C. At the eutectic temperature the iron sulphide rich solid solution was found to dissolve 2.0 per cent of manganese sulphide and the manganese sulphide rich solid solution to dissolve 75 per cent of iron sulphide. At room temperature however, the former solid solution would only dissolve 0.5 per cent manganese sulphide and the latter solid solution 24 per cent of iron sulphide. For the melting point of iron sulphide Shibata obtained the value 1173°C and for manganese sulphide the value of 1610°C.

Shibata's work is a convincing illustration of the mutual solubility of iron sulphide in manganese sulphide and of manganese sulphide in iron sulphide.

Manganese sulphide is only slightly soluble in molten cast iron, and at these high temperatures the above reaction proceeds to the left, thus increasing the concentration of iron sulphide which is very soluble in cast iron. Whiteley[7] was able to show that at temperatures above the solidus the sulphide consisted predominantly of FeS.

It is thus important to note that, even when only manganese sulphide is present at room temperature and an excess of manganese is available, appreciable amounts of iron sulphide are formed, due to the reversibility of the reaction over the temperature range 1100°C-1600°C, the temperature range for the handling of molten cast iron.

On the other hand, when consider-

(*Continued on page* 220)

Carbon Monoxide

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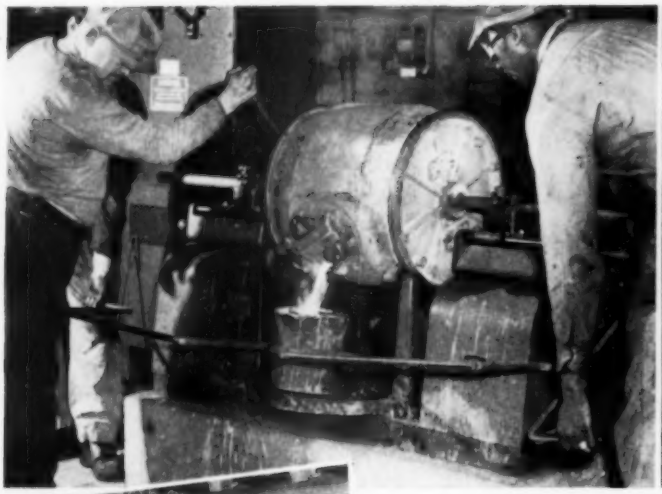

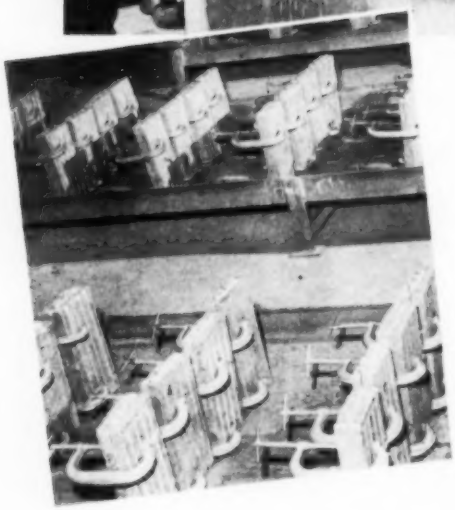

WELDING RODS CAST

In Graphite Molds

CASTING welding rods recently was begun at the Spaulding Works, Crucible Steel Company of America, Harrison, N. J., as part of Spaulding's $3,200,000 expansion program. The newly designed plant produces a wide range of cold rolled alloy, stainless and high-carbon steel specialties, and is the center of Crucible's special products manufacturing and development activities for the production of magnets, precision castings, cast alloy tools and alloy welding rods.

The welding rods being cast are used to provide a hard surfacing metal which can be welded to softer metals, especially metals which receive constant wear and shock. The exact formula and production technique for this new product were developed over an extended period of time by the company's metallurgists.

View at upper left shows metal being poured from one of the new electric rocking arc furnaces into a ladle. During the heat, the molten cobalt or iron alloy is subjected to temperatures ranging between 2800 and 3100° F.

From the ladle, the metal is poured as shown at upper right, into fast-cooling graphite molds to form finished hard surfacing welding rods. A specially designed ladle shank, which is shown clearly in this view, is made necessary by the furnace design. The U-shaped sections on each side of the ladle are designed to fit around two sections of the furnace base, as shown at upper left, so that the ladle will extend between the base sections to receive the molten metal.

Close-up view of the graphite molds is presented at lower left.

(*Continued from page* 218)

ing reactions in the solid, it is equally important to note that, in irons containing some excess of sulphur over that required to neutralize the manganese, and thus showing sulphur partially as iron sulphide in the as-cast structure, the excess sulphur may be all or partially dissolved in manganese sulphide at the annealing temperature. Hence the important reservation that true spherulitic nodules are only obtained when free iron sulphide is present at the annealing temperature.

In irons where the manganese sulphur ration is low, iron sulphide may be found alone, or associated with manganese sulphide. It appears, therefore, from the facts mentioned, that the iron sulphide or manganese sulphide may be formed in the solid state either from a manganese sulphide rich solid solution or an iron sulphide rich solid solution, respectively.

In view of the fact that the mode of occurrence of sulphur has been shown to have such a pronounced effect on the nodule formation and graphitizing reaction, it is suggested that the facts concerning the reversible reaction $FeS + Mn \rightleftharpoons MnS + Fe$, and the mutual solubilities of iron sulphide and manganese sulphide, should be given further consideration.

It is also suggested that published formula, indicating that the optimum manganese content for blackheart malleable is given by Mn % = 1.72 × S% + x should be treated with caution. The writer believes that x will be affected by melting times, furnace atmosphere during melting, and late additions of ferromanganese or aluminum.

Practical work by Palmer[3] on the manganese-sulphur ratio in malleable cast iron over the last two or three years, is of great importance. The early stages of this work have been reported and further data are eagerly awaited. Palmer used two levels of silicon content with varying manganese and sulphur contents. Many melts were cast and test bars annealed under fixed and controlled conditions, complete cross-sectional microspecimens were cut from each 0.875-in. diameter bar—a total of some 90 specimens.

It was obvious from the metallographic examination that little or no ferrite occurred associated with graphite nodules in compositions con-

(*Continued on page* 222)

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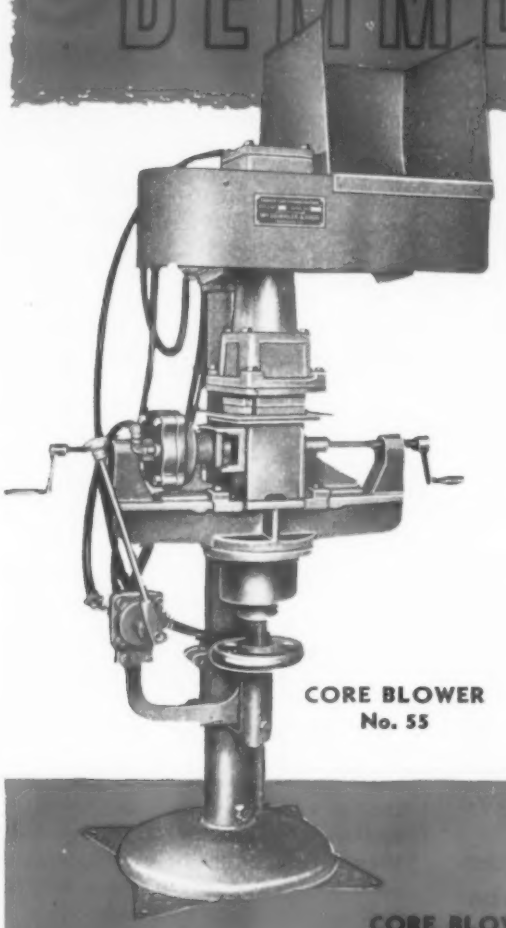

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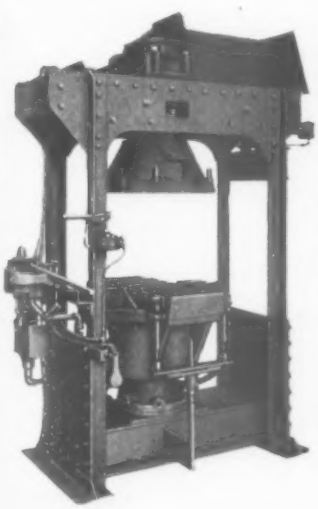
At the left is the popular DEMMLER No. 55, a small core blower unequaled for blowing cores up to four pounds. Will accommodate boxes 9" long. Sand magazine and carriage are aluminum castings, mounted on ball bearing rollers for easy pushing from filling to blowing position. Machine has both vertical and horizontal air operated core box clamps, controlled automatically by the same valve that blows the core. Ideal for short run jobs. Simple in construction . . . simple in operation, the DEMMLER No. 55 has earned the praise of foundrymen everywhere.

CORE BLOWER No. 1

Well known and liked by foundrymen is the DEMMLER No. 1, at left. This is a general purpose machine for blowing cores weighing up to eight pounds, such as plumbing goods, electrical fittings up to 1½", and various small brass, malleable and grey iron castings. The No. 1 possesses quick job changing features. Chuck table is raised and lowered by a hand wheel. Chuck jaws are easily adjusted for different core box widths. Will blow either horizontal or vertical. Different size sand magazines available. Capacity: approx. 200 core boxes per hour. Many have been in continuous, profitable use for more than 25 years with only minor repairs!



CORE BLOWER No. 3E

The DEMMLER No. 3E core blower, at left, has gained an enviable reputation as a highly efficient machine for use on large cores which can be blown to advantage by attaching the top half of the core box to the blow plate and drawing the core on the machine.

An important feature of this machine is that the table height is adjustable by means of the large nut on the base, so that only as much draw is used as required.

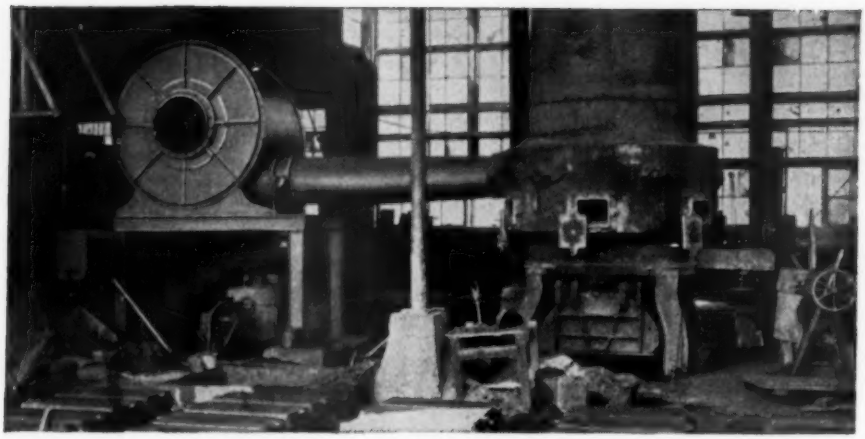
The No. 3E is outstanding for automobile work and similar castings. The cylinder has a long center guide stem which slides in a sleeve, to insure a draw of extreme accuracy. Two hand valves operate the machine — one moves the carriage from filling to blowing position, the other raises the table, blows and draws the core. Time cycle is about 12 seconds.

Draw cylinder is 17 inches in diameter, has 10 inch stroke. Will blow cores weighing up to 35 lbs. Here is a large capacity, high production core blower with draw cylinder feature that is unexcelled in its field.

There is a DEMMLER Core Blower to meet every requirement. Let us help you with your particular needs. Illustrated specification sheets on any of the three Core Blowers will be sent upon request.

Wm. DEMMLER & BROS.
KEWANEE, ILLINOIS

MANUFACTURERS OF CORE BLOWERS EXCLUSIVELY SINCE 1911



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THE SPENCER FOUNDRY TURBO

For more than forty years foundrymen everywhere have relied on the performance of the Spencer Turbo Compressor.

The very simplicity of the centrifugal design, with wide clearances, only two bearings, and no special foundations is part of its answer. The Spencer Turbo is inherently ideal for foundries because the volume and weight of air can be controlled by hand or automatically.

Air requirements for foundry cupolas are given in the Spencer Foundry Bulletin No. 112, and complete calculations for all Turbo applications including oil and as-fired equipment are given in the Spencer Turbo Data Book No. 107.

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No. 109 ..... Gas Boosters
No. 112 ..... Foundry Blowers

332-A

SPENCER HARTFORD — THE SPENCER TURBINE CO. HARTFORD 6, CONN.

(*Continued from page* 220)

taining a large excess of manganese or sulphur according to their chemical equivalents.

When this excess of manganese was progressively reduced by an increasing sulphur content the amount of ferrite was shown to increase. A maximum amount of ferrite associated with graphite nodules was found in compositions, with the manganese and sulphur contents almost exactly balanced according to their chemical equivalents. A significant change in the structure of the matrix was observed with sulphur contents slightly in excess of this balance. Ferrite no longer enveloped the graphite nodules, and the previously fine pearlite had become more coarsely lamellar.

Structure Changes Progressively

Further increases of sulphur content caused the pearlite to become more divorced until it became associated with hypereutectoid cementite. Nodules of the flake aggregate type were observed in all compositions having an excess of manganese and up to the stage at which manganese and sulphur were balanced. With increasing sulphur, from the first small excess over the balance, the nodules became more compact and were without a ferrite envelope. Finally, the excess of sulphur was of such an order that the true spherulitic nodules were obtained.

Using this metallographic evidence, Palmer prepared a chart in which all the compositions studied were plotted according to their sulphur and manganese contents. The compositions found to give no ferrite associated with compact or spherulitic nodules and lamellar pearlite, were represented by a circle. Those showing the flake aggregate nodules associated with ferrite and/or fine pearlite, were represented by a cross. On dividing the chart by a straight line, indicating the compositions at which manganese and sulphur are balanced according to their chemical equivalents, it was found that with few exceptions the circles lay on the sulphur-rich side, and the crosses on the manganese-rich side of the line.

The compositions found to contain true spherulitic nodules have been indicated by *N*. This area has been marked off with a dotted line. The chart obtained is shown in Fig. 11.

It will be gathered, therefore, that for compositions between the curved line and the straight line, nodules had a structure intermediate between that of the spherulite and that of the flake aggregate nodules. These

(*Continued on page* 224)

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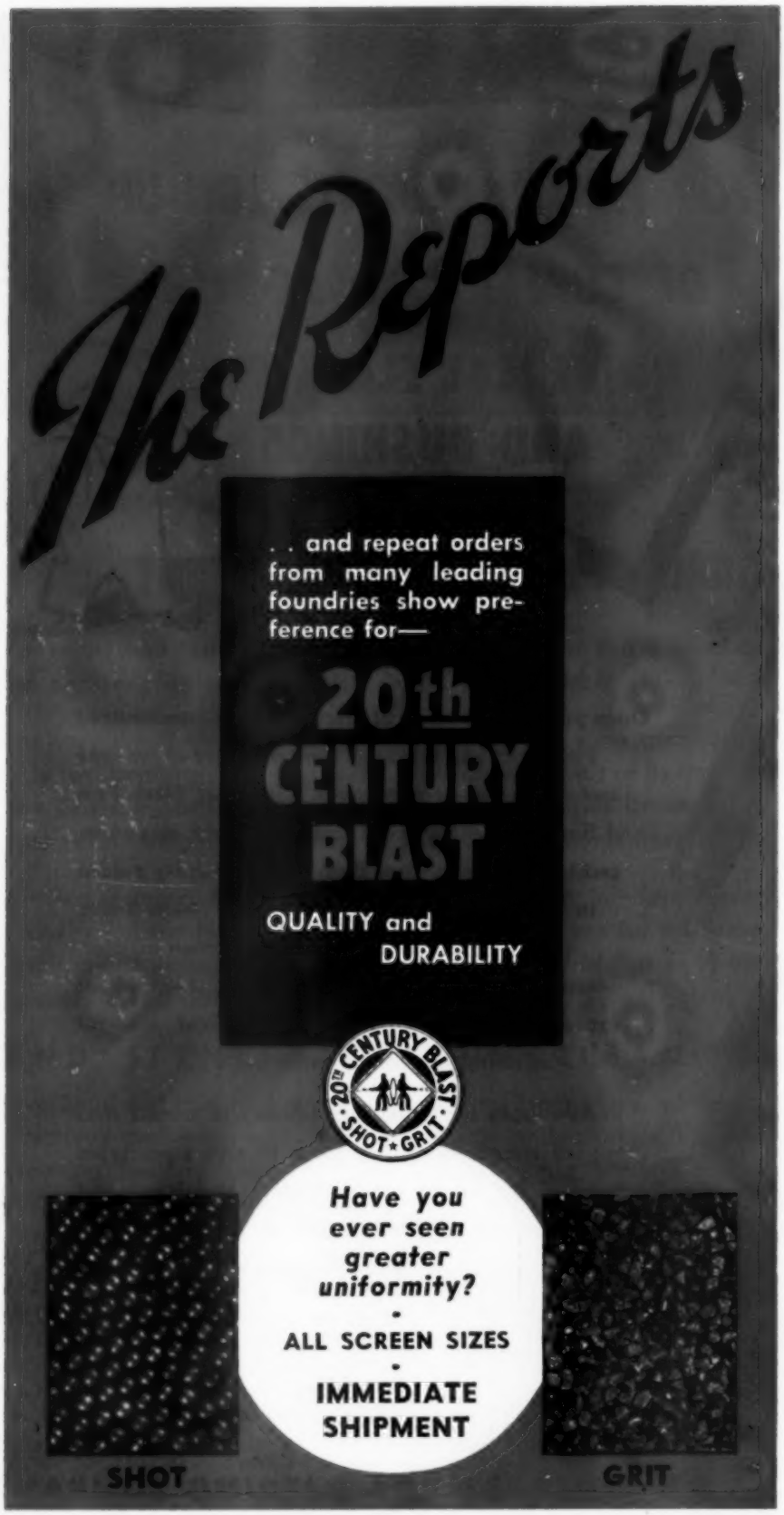

THE CLEVELAND METAL ABRASIVE CO.

Main Office and Plant: 880 East 67th Street, Cleveland 8, Ohio

Howell Works—Howell, Michigan

(Continued from page 222)

nodules were not associated with ferrite. The conclusion must be that on heating, the excess of sulphur present in these compositions wholly or partly dissolves in manganese sulphide, thus affecting the type of nodule produced.

However, on cooling from completion of the first stage annealing, the excess sulphur was sufficient to prevent the formation of ferrite around the semicompact nodules. Palmer is thus able to state with confidence that a critical condition is reached when the manganese content is equal to the sulphur content in terms of their chemical equivalents.

Fig. 13 shows the structure of an iron whose composition lay between the curved line and the straight line after completion of annealing. It will be observed that both the intermediate and the true spherulitic nodule are present in the same sample.

Space does not permit Palmer's work to be fully presented, but the following brief comments are of interest:

With either moderate excesses of manganese or sulphur, eutectic cementite persisted, even after 100 hours at 1000°C.

This was particularly so in the low-silicon compositions. For a comparative few of the compositions studied, Palmer has published graphite/time curves. Only general and tentative conclusions can be drawn until more are available, although the influence of silicon content is very clearly indicated. It would appear that except for thin section castings capable of being almost wholly decarburized, the use of silicon contents below 0.6 per cent will necessitate very prolonged annealing cycles to avoid the persistence of eutectic cementite, unless the manganese and sulphur contents are balanced to within close limits.

With increasing sulphur contents there is a progressive decrease in nodule size, and an increase in their compactness. Mechanical test results are worthy of serious study.

Rate of Decarburization — Palmer carefully measured the width of the ferrite rims obtained in the above investigation and used these as an indication of the depth of decarburization. He concludes that there is a gradual increase in the amount of decarburization with increasing sulphur contents up to the point of balance, and a marked increase after the sulphur contents reached excess. That the depth of ferrite rim can be used to indicate depth of decarburi-

zation, appears to be open to question, as our knowledge relating to the formation of ferrite at the surface is by no means complete, and may be affected by the fact that manganese lowers the critical point. The conclusions, however, appear to be borne out by the graph shown in Fig. 14.

Fig. 14 indicates the residual carbon contents obtained analytically, after fully annealing samples of white cast iron. Dotted lines indicate compositions containing a slight excess of sulphur, plain lines compositions containing a slight excess of manganese. Carbon and silicon contents were identical.

It appears that in the early stages of the annealing process, when the speed of decarburization is very fast, the process is controlled by solution rate of cementite, known to be slow in the presence of excess sulphur. Later, rate of carbon diffusion is probably most effective, and appears to be faster in the sulphur-rich metal than in the manganese-rich metal. Finally, the precipitation and resolution of graphite take control.

This suggests that decarburization may take place faster in thin sections, and slower in thick sections in white irons containing excess manganese, than in white irons containing excess sulphur.

This may account for the conclusion of Baukloh, Schulte, and Friedericks[8] being the reverse of Palmer's, indicating that excess of manganese results in an increase in the rate of decarburization.

(To be concluded next month)

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Liquid Carbonic Corp., Chicago, has purchased the Paschall Oxygen Co. of Philadelphia. The newly acquired company will be operated as the Paschall Oxygen Division of Liquid Carbonic Corp. F. H. Lewis, sales manager of Liquid Carbonic Corp.'s Wall Chemicals Division, will supervise operations.

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Howell Works—Howell, Michigan

FOUNDRY Statistics

Castings Production

in Philadelphia Federal Reserve District
(March, 1949)

Type	Percentage Change From Feb., 1949	Mar., 1948
Gray Iron	— 1.2	—25.2
Malleable Iron	—16.1	—49.0
Steel	— 2.7	— 6.7
Nonferrous	—17.3	—35.8

Source: University of Pennsylvania.

Foundry Production Workers

ESTIMATED NUMBER:

Type Foundry	Jan. 1949	Dec. 1948	Jan. 1948
Gray Iron	109,000	113,100	120,400
Malleable Iron	36,500	39,000	37,900
Steel	73,800	74,900	71,300
AVERAGE WEEKLY EARNINGS:			
Gray Iron	$57.14	$58.88	$57.31
Malleable Iron	59.31	61.49	59.03
Steel	62.21	63.79	59.48
AVERAGE WEEKLY HOURS:			
Gray Iron	39.0	40.0	41.6
Malleable Iron	39.3	40.1	41.5
Steel	40.3	41.2	41.1

Source: Bureau of Labor Statistics. Estimates of number of foundry production workers adjusted to Federal Security Agency data through 1945.

Index of Foundry Equipment Orders

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1948	1949
Jan.	380.9	149.9
Feb.	367.3	144.4
Mar.	326.2	....
Apr.	412.0	....
May	388.5	....
June	376.8	....
July	456.3	....
Aug.	324.7	....
Sept.	273.5	....
Oct.	296.0	....
Nov.	284.4	....
Dec.	243.7	....

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Shipments of Castings

(Reported by Bureau of the Census)

Gray Iron Castings

(Net tons)

	Shipments—Total	Shipments—For Sale	Unfilled *Orders
1947			
Nov.	1,020,239	561,660	2,687,244
Dec.	1,066,211	587,933	2,782,236
Total	12,540,960	7,181,299	.....
1948			
Jan.	1,064,335	584,238	2,802,685
Feb.	1,024,450	571,406	2,769,408
Mar.	1,169,085	659,821	2,726,415
Apr.	1,051,083	584,969	2,690,893
May	992,692	555,728	2,601,626
June	1,072,040	597,624	2,587,081
July	914,464	490,359	2,601,084
Aug.	1,050,948	597,678	2,598,789
Sept.	1,088,051	615,978	2,587,385
Oct.	1,148,422	642,485	2,522,831
Nov.	1,099,827	606,380	2,406,737
Dec.	1,110,512	624,739	2,284,348
Total	12,785,909	7,131,405	.....
1949			
Jan.	1,040,343	573,164	2,064,861
Feb.	986,591	535,163	1,857,403

Steel Castings

(Net tons)

	Shipments—Total	Shipments—For Sale	Unfilled *Orders
1947			
Nov.	130,125	97,143	493,309
Dec.	148,124	110,970	489,364
Total	1,625,055	1,203,504	.....
1948			
Jan.	141,068	108,282	491,745
Feb.	142,434	107,762	497,097
Mar.	162,891	125,550	508,822
Apr.	150,305	114,896	472,370
May	143,337	111,616	482,531
June	152,894	117,794	469,973
July	120,445	87,927	497,410
Aug.	140,223	107,538	472,481
Sept.	149,222	112,551	447,972
Oct.	152,983	114,819	424,460
Nov.	146,835	110,275	395,013
Dec.	157,395	116,285	354,458
Total	1,760,032	1,335,295	.....
1949			
Jan.	140,577	103,503	338,889
Feb.	135,042	99,425	320,202

Malleable Iron Castings

(Net tons)

	Shipments—Total	Shipments—For Sale	Unfilled *Orders
1947			
Nov.	72,111	39,969	206,510
Dec.	77,757	44,042	202,408
Total	895,054	513,228	.....
1948			
Jan.	77,927	45,788	205,859
Feb.	75,225	42,670	209,447
Mar.	86,767	50,065	203,351
Apr.	80,602	46,034	199,578
May	76,078	42,338	191,553
June	81,747	48,170	178,760
July	64,995	35,018	180,421
Aug.	73,272	41,201	176,824
Sept.	77,815	43,985	164,002
Oct.	81,761	44,305	158,351
Nov.	77,194	42,241	146,422
Dec.	79,882	43,397	137,385
Total	933,265	525,212	.....
1949			
Jan.	71,876	38,040	126,393
Feb.	66,744	35,074	118,318

Aluminum Castings

(Thousands of pounds)

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Unfilled *Orders
1947				
Nov.	34,683	11,428	13,558	83,975
Dec.	37,489	12,552	13,784	81,784
Total	441,996	155,112	174,515	.....
1948				
Jan.	37,889	12,670	15,020	86,176
Feb.	37,963	12,177	15,055	88,032
Mar.	41,794	13,343	16,258	78,344
Apr.	38,269	12,407	14,563	78,499
May	33,868	11,854	12,351	75,219
June	35,822	12,296	13,239	72,930
July	28,944	9,851	10,504	70,321
Aug.	32,136	9,883	13,174	68,334
Sept.	35,877	11,822	13,353	66,773
Oct.	35,542	11,733	13,216	65,538
Nov.	34,550	11,410	13,012	63,767
Dec.	31,836	10,335	11,589	59,154
Total	424,490	139,781	161,334	.....
1949				
Jan.	29,142	9,702	10,386	55,580
Feb.	27,228	9,286	9,339	52,916

Copper-base Alloy Castings

(Thousands of pounds)

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Unfilled *Orders
1947				
Nov.	81,803	74,274	3,773	73,851
Dec.	87,215	79,495	4,393	74,814
Total	1,051,742	960,732	51,139	.....
1948				
Jan.	85,432	77,433	4,593	74,579
Feb.	87,169	79,329	4,509	71,143
Mar.	96,344	87,249	5,261	70,544
Apr.	89,035	80,426	4,705	70,726
May	81,286	72,982	4,910	65,818
June	84,817	76,241	5,148	64,149
July	71,803	64,389	4,670	66,014
Aug.	81,976	73,947	5,018	69,126
Sept.	86,973	78,830	4,999	66,574
Oct.	91,311	82,463	5,293	62,571
Nov.	86,497	77,751	5,107	60,892
Dec.	88,182	79,750	4,796	53,671
Total	1,030,825	930,790	59,009	.....
1949				
Jan.	76,348	68,379	4,593	48,124
Feb.	68,776	61,278	3,951	40,517

Magnesium Castings

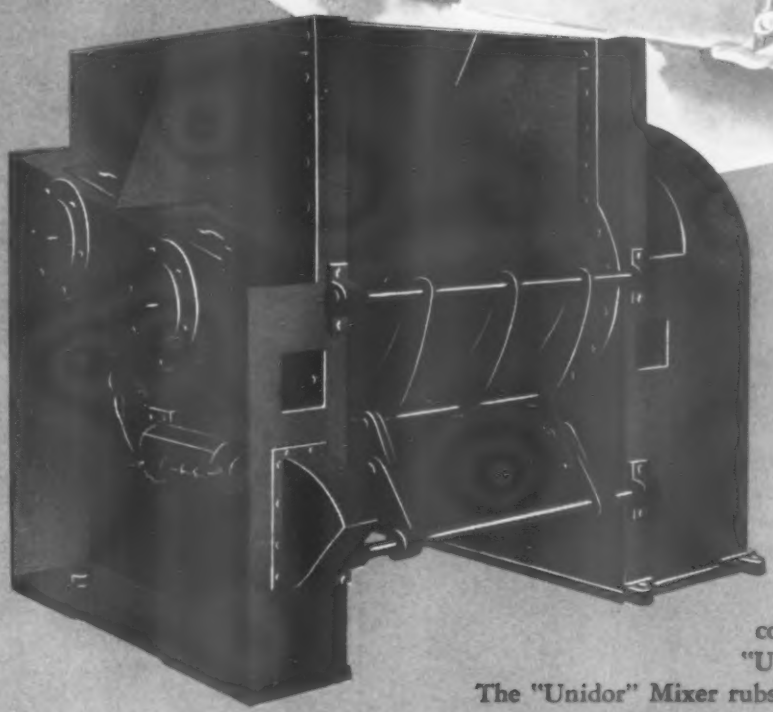
(Thousands of pounds)

	Shipments—Total	Shipments—For Sale	Unfilled *Orders
1947			
Nov.	602	545	2,808
Dec.	669	587	2,730
Total	7,693	7,050	....
1948			
Jan.	659	597	2,701
Feb.	655	591	2,866
Mar.	704	625	2,741
Apr.	673	605	2,640
May	622	542	2,673
June	709	624	2,712
July	554	521	2,684
Aug.	703	655	2,834
Sept.	745	700	3,206
Oct.	708	650	3,070
Nov.	728	683	3,416
Dec.	754	695	3,455
Total	8,214	7,488	....
1949			
Jan.	822	761	3,821
Feb.	813	756	3,586

* For sale only.

better core sand means fewer rejects

Baker Perkins Unidor core Sand mixer



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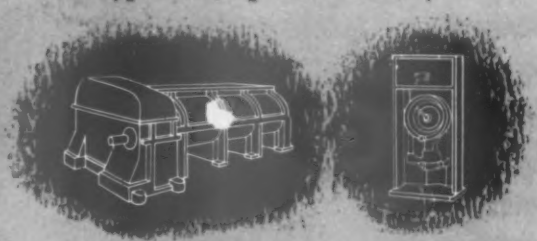

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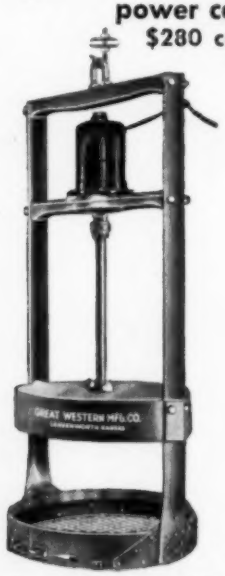

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Conference Studies Industrial Safety

The President's Conference on Industrial Safety, held at the U. S. Department of Labor, Washington, drew 1200 delegates who adopted an "action now" program calling for state conferences on industrial safety and continuation of the President's Conference as "a national organization of co-operating agencies, public and private, dedicated to the prevention of job injuries."

Top officials and executives presented various reports of committees, prepared under their direction and that of a labor official as vice-chairman.

Report subjects and committee chairmen follow: Industrial Accident Records as a Measure of the Problem, by Ewan Clague, Commissioner, Bureau of Labor Statistics; Engineering Approach to Industrial Safety, by James E. Trainer, Firestone Tire & Rubber Co., Akron, O.; Development of Safety Laws and Regulations, by Almon E. Roth, attorney, San Francisco; Education in Accident Prevention, by C. W. Beese, Director, Purdue University Extension Division, Lafayette, Ind.; Labor and Management Cooperation for Safety, by Harold C. Zulauf, Alexander Smith & Sons Carpet Co., Yonkers, N. Y.; Research for Safety, by Fred W. Braun, Employers Mutual Insurance Co., Wausau, Wis.; Research for Safety, by W. P. Yant, Mine Safety Appliances Co., Pittsburgh.

The report of the Co-ordinating Committee, presented by William L. Connolly, chairman, indicated that safety, like freedom, is everybody's business. The report pointed out that there is no single cause or cure for industrial accidents. Accidents likewise are no respecter of size or kind of business, but the majority occur in the 2½ million small firms, even though they employ a lesser proportion of the work force.

In outlining the program fundamentals, it was indicated that the elimination of physical hazards is a first step in building an effective safety program. However, before job injuries can be reduced to a minimum, each worker needs to be educated and trained so that his behavior is reasonably safe at all times. The report points out that this can be accomplished by the inclusion of safety in all phases of our educational system as well as the expansion of "on the job" safety education and training activities.

Top management must accept full

(*Concluded on page* 230)

YOU'LL GET FASTER • EASIER PRODUCTION WITH A NEW AIR SQUEEZE

Moline 55 MOLDING MACHINE

THE NEW 55 HEAVY DUTY PORTABLE FEATURES A PNEUMATIC HANNIFIN CYLINDER

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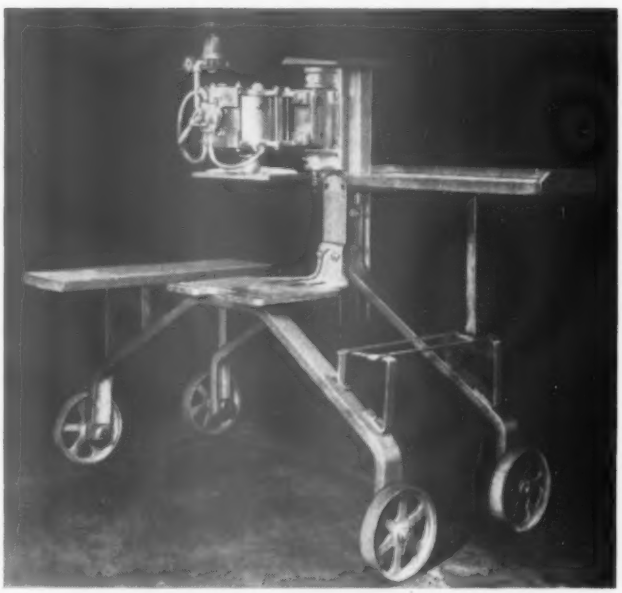
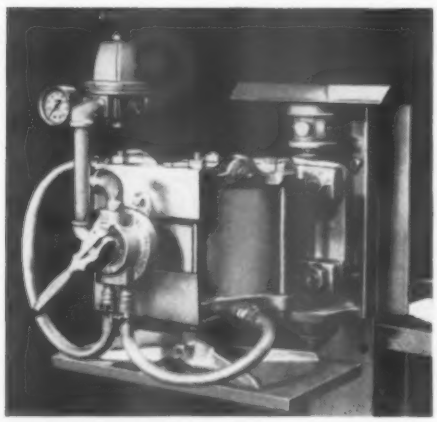
Double cup piston featured in Series "LW" cylinders provide simplicity, economy and smooth operation.



MOLINE 55 MOLDING MACHINE WITH PNEUMATIC HANNIFIN CYLINDER



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MOLINE, ILLINOIS, U. S. A.

(*Concluded from page* 228)

responsibility and support for rendering workplaces and work methods safe. A definite safety policy should be formulated and made thoroughly clear to every employee. The report recommends that accident records be maintained to show frequency rates, sources, causes and costs. In the development of the program, tested and accepted safety techniques should be incorporated. Foremen, as the front line of management, should be thoroughly trained in safety fundamentals and every worker should receive adequate training in the safe methods of doing his job.

MEASURING TENSILE STRENGTH OF MANGANESE BRONZE

(*Concluded from page* 75)

1. Varying water temperatures when quenching samples.
2. Method of casting samples.
3. Human element.

The human element is probably the most important, since an experiment of this nature carried out in the shop is not as accurate as experiments done in the laboratory.

Thus we see that once the properties of this alloy are estimated by Ellis[2] curves, the charge can be melted, completed, and checked by this simple, quick test, and any changes noted can be altered. Once the tensile is estimated from the brinell hardness an addition of zinc can be made, if necessary, to increase the tensile strength, or additional flaring can be done to lower the tensile strength should the hardness be too high. Fig. 5 shows a section of quality control charts with routine production results.

The author wishes to express thanks to Edwin Bishop, bronze melting foreman, for assistance in developing the method and carrying out tests. Thanks also are tendered to Fred Jobson, bronze foundry superintendent, for his kind encouragement and co-operation. This work was done under the supervision of H. H. Fairfield, Chief Metallurgist of Wm. Kennedy & Sons Ltd.

TABLE I—Bhn vs Tensile Strength—Practical Range

Bhn	T.S. Range (psi.)
134	64,800-67,800
137	65,800-68,800
140	66,800-69,800
143	68,000-71,000
146	68,800-71,800
149	70,000-73,000
152	71,000-74,000
156	72,600-75,600
159	73,800-76,800
163	75,000-78,000
167	77,200-80,200
170	77,800-80,800
174	79,000-82,000
179	80,800-83,800
183	82,200-85,200
187	83,800-86,800
192	85,600-88,600
197	87,200-90,200

TABLE II—Tensile Strength vs Elongation—Practical Range

Tensile (psi)	Elongation (%)
66,300	43-49
67,300	40.8-46.8
68,300	39.0-45.0
69,500	36.0-42.0
70,300	35.0-41.0
71,500	32.0-38.0
72,500	30.0-36.0
74,100	27.0-33.0
75,300	24.0-30.0
76,500	21.0-27.0
78,700	17.0-23.0
79,300	15.0-21.0
80,500	13.5-19.5

References

1. Thomas L. Sheehan and Howard E. Dickerman, "Stress Corrosion of Manganese Bronze Castings", THE FOUNDRY, July, 1948.
2. O. W. Ellis, "Copper and Copper Alloys", ASM, 1948.

TROUBLE-FREE PRODUCTION of quality castings doesn't just happen. The skill and know-how of diecaster or foundry is of prime importance. But the most skilled of craftsmen must have the right raw material to work with.

Whatever your casting problem may be —die cast—permanent mold or sand cast. Specify **S-G** Aluminum Alloys. Every step in their production is checked constantly by skilled laboratory men using the most modern equipment available.

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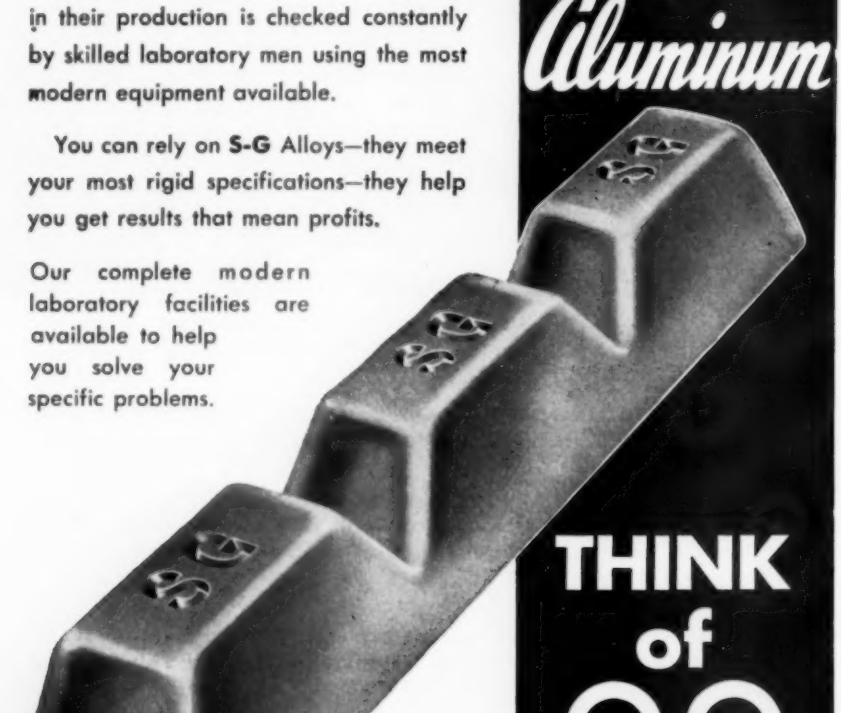

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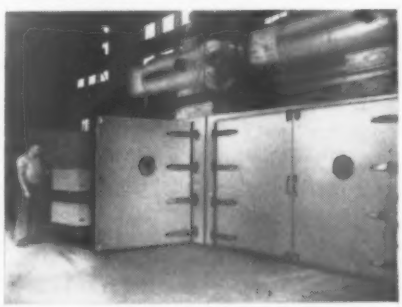
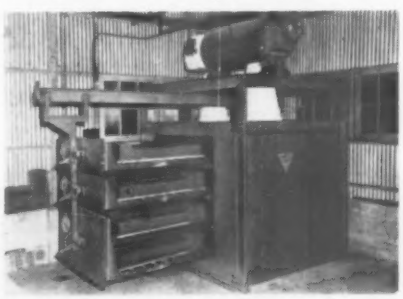
Why Foundries Get More Production with DESPATCH OVENS

Despatch continuous conveyor Oven, gas-oil fired. Cores on 38 racks make 2 horizontal passes through bake chamber, then enter cooling section.

Straight-as-an-arrow production is obtained with this Despatch vertical Oven; oil-fired. Average output is 5,000 lbs. hourly.

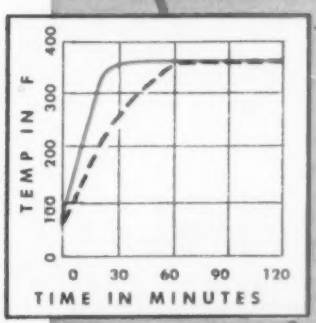


Sixteen 450-lb. cores make normal load for each of these Despatch Batch Ovens. Oil-fired. Each oven has separate heater.



Despatch Drawer Oven. Each drawer can be opened without affecting baking in other drawers.

Here's the Answer!



Specially engineered HIGH VOLUME forced convection heating systems are provided on all Despatch Ovens to give extra-fast heat transfer.

Graph shows typical heat curve of a Despatch Oven, with air temperature in red, load temperature shown by dotted line.

On each installation the heater, fan and ducts are carefully inter-balanced to assure maximum uniformity, speed and heat transfer efficiency. Despatch's high air velocity means FASTER HEAT TRANSFER.

As proved by actual foundry records, DESPATCH Ovens of all types have baking capacities *far in excess of most ovens of similar size* and type. And these results are obtained without loss of other important advantages, such as fuel economy, ease of handling and use of floorspace!

DESPATCH *experience* makes this possible—experience in use of high volume forced convection heat, with heaters, fans and ducts *specially* sized and engineered to provide exceptional speed and uniformity in heat transfer.

In one foundry, officials familiar with other ovens thought they needed an oven with a 10' x 8' x 14' chamber. But Despatch installed an oven with a 5' x 7' x 6½' chamber that has MORE baking capacity than the suggested larger unit . . . yet cost $1337 less . . . uses 124 sq. ft. less floorspace and requires less fuel!

Despatch Has the *Right* Oven for You.

CONVEYOR OVENS: Bake up to 10,000 lbs. per hour . . . give maximum output per ft. of floorspace . . . straighten coremaking lines . . . save labor. Vertical, elevated, horizontal types; gas or oil.

BATCH OVENS: First choice of most foundries and ideal for all sizes of cores . . . easily installed . . . easily enlarged. Car, rack, truck and shelf models; gas, oil and electric heaters.

DRAWER OVENS: Bake thick and thin cores at same time . . . popular for both production and special rush jobs. Easy to load and unload. Available in 48 models: gas, oil or electric.

Write TODAY FOR BULLETINS 30, 31 AND 32 AND COMPLETE INFORMATION

DESPATCH OVEN CO., MINNEAPOLIS OFFICE: 619 S.E. 8th ST. CHICAGO OFFICE: 221 N. LASALLE ST.

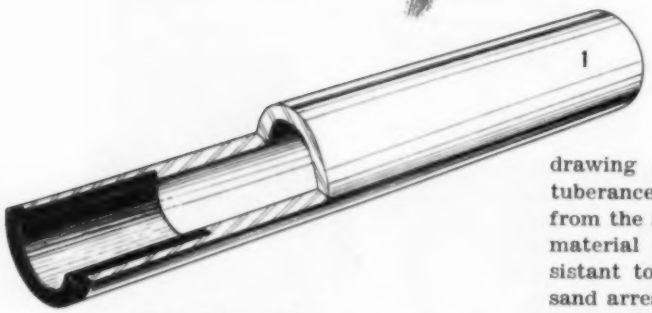
31-J

45 YEARS OF SPECIALIZED SERVICE TO AMERICA'S FOUNDRIES

OFFICES IN ALL PRINCIPAL CITIES

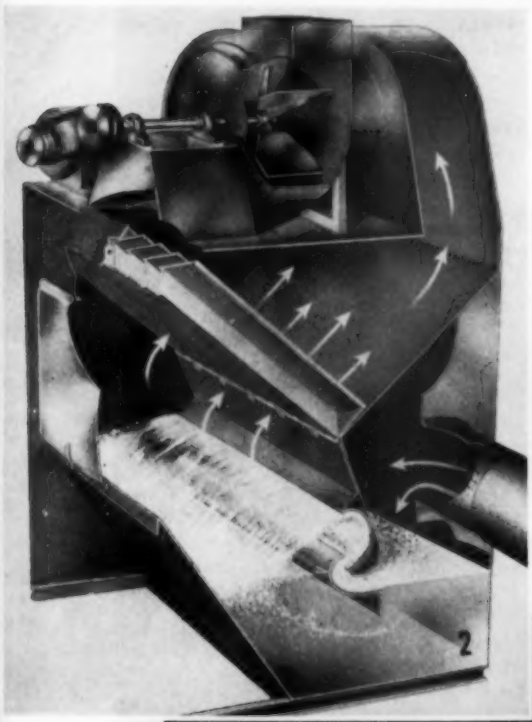
DESPATCH OVEN COMPANY

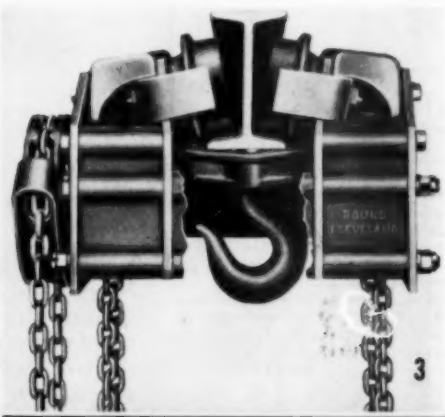
NEW Equipment AND SUPPLIES



(1)—Blow Tube: Martin Engineering Co., 704 Rose St., Kewanee, Ill.—Tube for use on core blowing machines has a bushing of resilient material bonded into the lower end. The material is formed with a choke effect and is said to stop the sand column, preventing the sand from drawing down and forming a protuberance which must be removed from the surface of the core. Bushing material is resilient and highly resistant to abrasion, thus retaining a sand arresting choke for a long time, it is claimed. The copper plated tubes are available in any size and length, and the resilient end is said to be contoured easily to conform to the corebox cavity.

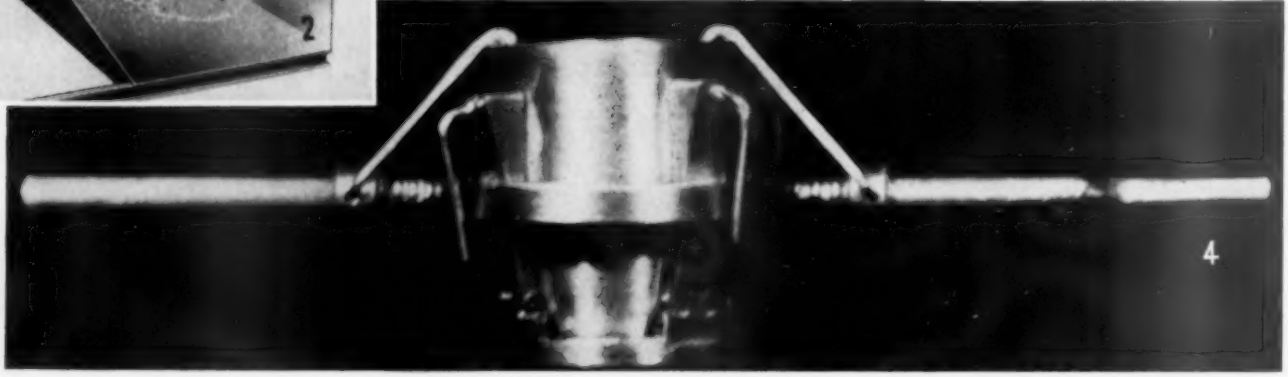
(2)—Dust Control: American Air Filter Co., 266 Central Ave., Louisville 8—Hydrostatic precipitator cleans air by the combined action of centrifugal force and a thorough intermixing of water and dust-laden air, reusing the water without recirculation pumps or spray nozzles. The unit, redesigned to permit wider application and improved performance, is available in capacities through 48,000 cfm. It is said to maintain a low pressure drop and can be operated from 50 to 120 per cent of its nominal rating without affecting its collecting efficiency. All sizes are available in either manual cleanout, sludge ejector or hopper bottom arrangement.





(3)—Trolley Hoists: David Round & Son, Broadway & Henry St., Cleveland 5—Trolley hoists are designed so that the head room required is reduced to the length of the hook only; when the hook is raised to maximum height, its shank touches the base of the beam. Hoisting mechanism employs two load sheaves with four strands of chain supporting the load. They are available in plain or geared trolley types and are built to fit beams of any one size and style; they are not adjustable to various sizes or styles of beams. The hoists are made in 13 sizes from 1 to 24 tons capacities.

(4)—Crucible Handling: Frank D. Bromley, 1038 West Main Rd., Portsmouth, R. I.—Self-adjusting, combination carrier and pouring device for handling crucibles or similar containers of flowable materials is designed to handle containers of various sizes and shapes in complete



safety. The device consists of a base having an annular upstanding rim for preventing the container, which is placed on the seat, from slipping out of position. Hinged at 90 degree points around the periphery of the base are four arms shaped on the inner side to conform to the wall of the container and on the outside in such a manner as to provide automatic adjustment for the lifting and carrying hoop. Projecting from the outside of the arms near the top are hooks, within which the hoop passes when the arms are lifted up. They serve to hold the hoop securely against the arms. Handles are attached to opposite sides of the hoop. Hooks which rest over the top edge of the container are attached to sliding collars which ride on the inner ends of the handles. Those hooks are held in place by springs, and help to hold the container in place.

Coated Fabric Gloves: Surety Rubber Co., Carrollton, O.—New coated fabric work gloves are said to have high resistance to chemicals and abrasion. The coating is a chemical adaptation of the company's synthetic rubber and is thick and pliable, providing adequate cushioning for all types of heavy work, it is claimed. Gloves are available in

knit wrist, band-top, and 12 and 14-in. gauntlet types. All types are jumbo size with curved fingers.

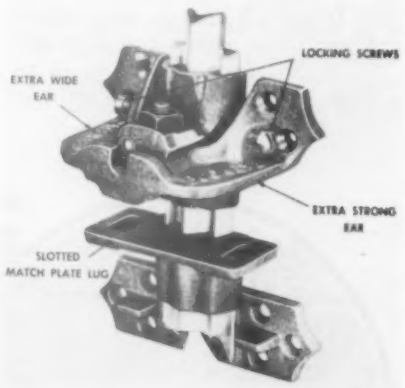
Gas-Air Mixer: Vapofier Corp., 10316 South Throop St., Chicago 43—New gas-air mixer is said to maintain a constant manifold pressure to any number of burners regardless of variations in burner requirement, within the capacity of the machine. It is further claimed that the mixer maintains a constant mixture ratio at all loads, and to handle all types of gas from LP (butane or propane) to manufactured. It can be arranged for high-low operation. It is available in three sizes with capacities from 35,000 to 2 million Btu. It can be used with existing air supply or may be supplied with a turbo compressor designed to furnish a steady, nonpulsing supply of combustion air.

Induction Furnace: Lindberg Engineering Co., 2444 West Hubbard St., Chicago 12—Channel flushing has been developed for the company's two-chamber induction melting furnace. The process is said to keep the channels between the two chambers clean and free of slag or oxide accumulations. With channel flushing, the primary coil of the furnace transformer is located in a manner to cause a greater volume of

molten metal to be impelled into one chamber than the other. This raises the molten metal level in the one chamber, and lowers the level in the other chamber. Every 60 seconds when the power is cut off automatically, the higher level subsides, and the molten metal flows to the other chamber until the same level exists in both chambers. When the current is restored the process is repeated. The constant flushing, stirring and mixing action is said to insure metal of uniform analysis and to cause a beneficial fluxing action.

Air Compressor: Davey Compressor Co., North Water St., Kent, O.—New 7 cfm lightweight compressor consists of a V-type, 2 cylinder, single stage compressor direct connected to a 4½-hp air-cooled engine and operating at 3000 rpm. Unit is equipped with an automatic centrifugally-actuated clutch which momentarily frees engine from compressor for starting, but re-engages at about 1500 rpm. Continuous operating pressure is 100 lb, but is capable of intermittent operation at 150 lb. The machine has been tested for operation in a temperature range of —65° to 130° F. Unit weighs 117 lb and is 29 in. long, 21 in. wide and 27 in. high.

Flask Guides: Buckeye Products Co., 7020 Vine St., Dept. F, Cincinnati 16—Flask guides incorporate four new improvements including new three-point locking arrangement



of slide and pin, wider and stronger ear and a slotted matchplate lug. The locking arrangement features two locking screws which hold the slide firmly against the pin. The added width of the ear is said to provide the molder a better grip when lifting the cope or turning the flask, and the added strength is said to permit jolting and squeezing operations without cracking or straining. Slotted matchplate lug is designed to provide faster attachment to the matchplate and correct adjustment to the pin. Guides are available for straight or tapered flasks in 3, 4, 5, 6, 7 and 8-in. lengths.

Paper Cups: Continental Can Co., 100 East 42nd St., New York 17—Paper cups used for serving beverages and food in plant cafeterias and commissaries have safety slogans printed on them and are intended to supplement industrial safety campaigns. Such slogans as "Do things the safe way!" "Use safety equipment provided for your protection!" and similar messages are tied in with the company's overall safety campaign. Slogans, typography and color are changed periodically to help hold employee interest.

Mills: Severance Tool Industries Inc., 753 Iowa St., Saginaw, Mich.—New series of carbide mills have ⅛-in. diam shanks and are made of solid carbide in one piece—cutting heads and shanks being integral. Series includes twelve different shapes selected as being the most popular for deburring and machining parts made from materials

that are abrasive, or tough, or having hardness ranging up to 60 Rockwell "C." The mills can be reground to give results comparable to new tools.

Circular Saw: Delta Mfg. Division, Rockwell Mfg. Co., 600 East Vienna Ave., Milwaukee 1 — Floor model 8-in. tilting arbor circular saw has a table 33 in. wide and 25 in. deep. It has a 2 5/16-in. deep cutting capacity. Maximum cut at 45 degrees is 1⅝-in. and dado cuts up to 13/16-in. wide can be made. The auto-set miter gage is all metal and has adjustable indexed stops at 45 and 90 degrees right or left. Stop rods for production work are included. Distance from front edge of the table to center of the blade is 15⅝-in. Table depth in front of blade at maximum cut is 12 in. In operation, doing 3800 rpm with a 1725-rpm motor, the 8-in. blade gives a total of 7800 surface fpm. Motor is not furnished with saw, but any standard ½ or ¾ hp, 3-phase, single phase or direct current motor in common voltages and frequencies may be used.

• "Lined half of melting zone 36" high with Buckeye 12" x 6" x 6" hand cut cupola blocks, and other half of melting zone was lined with ——. We melted 100 tons in about six hours. Buckeye blocks burned off approximately 1½" with no holes and very uniform wear. Opposite side will require considerable patching."
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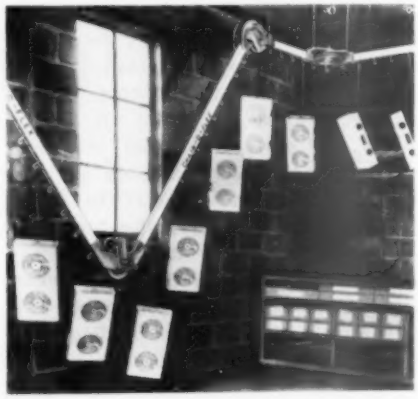
Chain Conveyor: Industrial Equipment Co., 315 North Ada St., Chicago 7—Flexible chain conveyor is designed for use where a constant flow of material or assembled products is needed. Quick assembly of any practical conveyor system pattern is a prime feature of the unit. All parts are bolted together. Corners



are flexible and adjustable to any desired degree. Variable speeds are obtained by adjusting the band wheel on the drive unit which will provide a 3:1 speed ratio. Multiple drive units may be used on extremely long conveyor systems.

Combination Burner: North American Mfg. Co., 4455 East 71st St., Cleveland 5—Combination gas-oil burner is designed for applications such as heat treating, forging and smelting where it will burn light or heavy oil as well as gas of any Btu content. It will burn natural gas at atmospheric pressure to give good single valve control. Without changing piping the operator can switch from one fuel to another. A sleeve type shutter allows for open or closed firing as desired. By disconnecting the oil line and removing two small bolts, the complete burner internals can be removed for ease in cleaning, it is claimed.

Pyrometer: Pyramid Instrument Co., 117 Lafayette St., New York — Pyrometer meter case is swivel mounted and can be moved in a horizontal arc from 0 to 180 degrees to provide accurate reading in

all directions. Flex arms of all sizes and shapes are available to facilitate mounting in ordinarily inaccessible locations. Pyrometer also can be furnished in flush or surface mounting without the flexmount. Black enameled, wrinkle finish metal case is 5¼ in. wide, 3-9/16 in. deep and 2¾ in. high. Mirrored scale is 3¾ in. long. A high resistance movement in the pyrometer enables slight changes to be made in the external resistance of the thermocouple of lead wire without the necessity of recalibration. Cold junction compensation automatically adjusts for variations in ambient temperature, thereby assuring true readings at the thermocouple hot junction, it is claimed.

Magnetic Sweeper: Multi-finish Mfg. Co., 2114 Monroe, Dept. 371A, Detroit 7—Sweeper equipped with permanent magnet is designed

to pick up steel and iron particles from floors, driveways, powders or liquids. It may be attached to a truck and is said to be waterproof and oil proof. An acidproof model adaptable for use in tanks also is manufactured. The magnetic tube is designed to rotate with the wheels and to load automatically to a thickness of ¾-in. on the entire 360 degrees of surface. Tool is unloaded by pushing the wiper ring from one end of the tube to the opposite end where a nonmagnetic area causes instant release of the load. Unloading area is tapered so parts slide off readily without lodging. Standard sizes range from 9 to 24 in. overall width; larger units made to order.

Metallizing Service: Bedford Gear & Machine Products Inc., 320 Harrison St., Bedford, O.—New service involves a precision metallizing process suitable for building a hard, wear-resisting surface on almost any metal part and for repairing blow holes in castings, providing a corrosion-resistant lining to tanks, making stainless steel overlay on rolls of various types, and to change or repair the contours of molds. Metallized overlays in some instances can be made up to 3 in. thick. Almost any metal that can be put into wire form can be sprayed, and the temperatures involved in metallizing are said not to cause warpage or destroy temper of the base metal.

Car Shaker: Allis-Chalmers Mfg. Co., 1126 South 70th St., Milwaukee 1—Car shaker is designed to empty coal, cinders, ore, slag, coke, sand, gravel and other granular materials from drop-bottom gondola cars. Weighing approximately five tons, the new car shaker is designed to fit all sizes of gondola cars manufactured in the United States. It has an all-welded 11 x 5 ft, 4 in. steel body which is lowered to rest on the car body flanges by a hoist or crane. Vibratory motion is transmitted to the car through an eccentric

THEY'RE A CINCH TO CARRY..
TRANSITE CORE PLATES are lighter, stronger, resist warpage.
• Core makers can handle more Transite* Core Plates at one time, thus make fewer trips. That means faster production with less fatigue and fewer accidents. Transite Core Plates offer all these advantages:
They Last Longer—Made of fibrous asbestos and cement, Transite Core Plates resist shock ... are less likely to crack or break.
They Clean Easily—Core wash, sand, etc., do not stick as readily as to other materials. Both sides are usable.
They resist Corrosion and Warpage—Transite Core Plate surfaces stay smooth even after long service. Warpage is less than 0.1%.
They are Economical—Low price, low maintenance and long life add up to low cost.
To eliminate green cores and reduce baking time perforated plates are also available.
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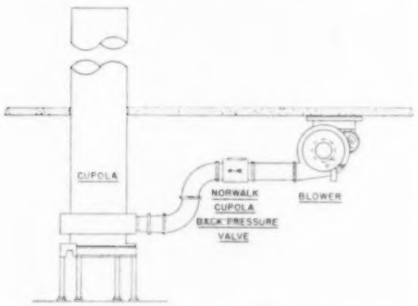
shaft mounted within the shaker body on heavy duty bearings. Unit is driven through Texrope drive by an enclosed, high-torque, rubber-mounted motor located inside the shaker body for full protection.

Displays: Elliott Service Co., Dept. BB, 30 North MacQuesten Parkway, Mt. Vernon, N. Y.—Display program to sell the advantages of the "American Opportunity System" to employees includes use of a hammer-tone silver finished, steel bulletin board, glass enclosed, with

either three, four or five panels, together with 17 x 22-in. attractive, multicolored displays, currently covering the profit story, accident prevention, cost and waste reduction and quality workmanship. Daily change of selected news pictures helps keep constant employee interest.

Cupola Valve: Norwalk Valve Co., 33 Railroad Ave., South Norwalk, Conn.—Cupola back pressure valve for cupola air lines is available in 8 to 36-in. sizes. It is designed to prevent back flow of combustible gases into piping, blower and the foundry itself. It automatically relieves the cupola operator from the responsibility of closing the blast gate in the air blast line to the cupola, following shutdown of the blower during a melt. Consequently it reduces the possibility of explosions which might cause injury to personnel or damage to equipment resulting in interrupted production.



Band Saw: DoAll Co., 254 North Laurel Ave., Des Plaines, Ill.—General purpose band saw for trimming castings has been stripped to bare essentials although refinements can be added as needed to meet specialized sawing requirements. It has a 36-in. throat and 20-in. thickness capacity. Work table is 36 x 30 in. with handwheel-operated table tilt 45 degrees to right and 5 degrees to left. Auxiliary table is 19 x 19 in. It is equipped with aircraft type hydraulic brakes on both saw carrier wheels. Saw guides are adjustable insert type for blades up to 2 in. and have antifriction thrust bearings. It can be furnished

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for handy use in making modern alloys
SHOT COPPER . . . . . .
SHOT COPPER-NICKEL . . .
SHOT PHOSPHOR COPPER .
and other alloys
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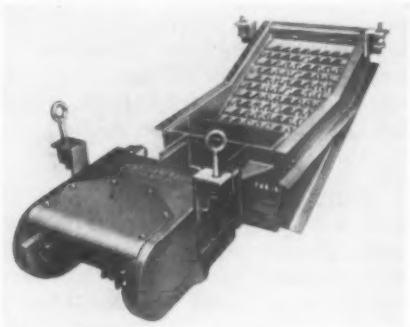
ASSOCIATE COMPANIES: AJAX ELECTRIC • AJAX ELECTROTHERMIC CORP. • AJAX ELECTRIC FURNACE • AJAX ENGINEERING

with direct or belted drive for single-speed sawing or with stepless variable blade speed control over a range of 100 to 5000 or 2000 to 10,000 fpm. Drive motors ranging from 3 to 10 hp are available.

Fire Sprinkler: Stop-Fire Inc., 125 Ashland Pl., Brooklyn 1, N. Y.—Portable automatic sprinkler fire extinguisher is constructed of heavy brass, silver welded, and makes use

of a new fire extinguisher fluid known as CBM or chlorobromomethane. Unit is hung over the area to be protected. If fire occurs, heat waves cause an approved sprinkler head to discharge under pressure a wide, fast-moving spray of combined carbon dioxide and atomized CBM. The spray is said to blanket and snuff out the fire, leaving no residue, stain or damage. It is effective against oil, grease, flammable liquid, lacquer, paint, solvent, or electrical fires. It is nonfreezing, and has minimum specification capacity of 700 cu ft.

Vibrating Screens: Syntron Co., 540 Lexington, Homer City, Pa.—Vibrating screens designed for rough sizing are made up with



stepped, punched plates having tapered elongated openings—the size of the latter depending upon material specifications. Single or multiple deck screen plates are available. Screen area is activated by a vibrating motor featuring variable control of material flow. This is said to provide a two-purpose piece of equipment, a vibrating screen and a rheostat controlled vibratory feeder, for increasing the efficiency and capacity of crushers and fine grinders and to prevent damage to belt conveyors by allowing the fines to cushion the lumps.

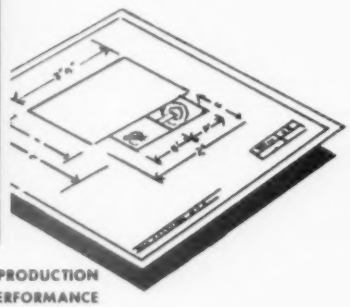
Insulating Lining: M. H. Detrick Co., 111 West Washington St., Chicago 2 — Insulating lining for breechings, flues, and ducts consists of block insulation supported by a system of bars which are held in position by bolts welded to the steel shell. The insulation then is covered with a cement which protects the insulation and resists a reasonable amount of abrasion, it is claimed.

Grinder: Hammond Machinery Builders Inc., Dept. GP-37, 1600 Douglas Ave., Kalamazoo 54F, Mich.—Double wheel carbide tool grinder may be used either wet or dry. It is equipped with 10 x 19-in. tables having a removable steel wear plate and table slot in which the compound

TOP PERFORMANCE WITH AJAX TAMA-WYATT

INDUCTION FURNACES for Aluminum Alloys

Ajax Induction Holding Furnace at Mid Western Die Casting Co., Chicago, Illinois



BETTER PRODUCTION THROUGH TOP PERFORMANCE IS THE AJAX RECORD

Ajax-Tama-Wyatt induction furnaces are used in large and small die casting plants in the United States and abroad for melting and holding aluminum alloys in die casting, permanent mold, and sand foundries.

No flux or mechanical stirring is necessary. The metal is in constant gentle circulation assuring complete blending of alloys, and a uniform temperature throughout the metal.

Electric energy costs less than fuel and avoids danger of overheating. Completely automatic temperature controls hold metal to within 5°F., at the lowest possible temperature for perfect casting. With an Ajax the yield for perfect castings is exceptionally high.

There are no fumes and operation is practically noiseless. Shops are cooler, more comfortable—manpower efficiency is increased. Shop space is increased, for an Ajax Holding Furnace takes an average of 30 to 40 per cent less floor space than any other furnace.

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IMPROVED
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● Speed plus safety is a reality with the improved CESCO No. 602 HEALTHGUARD ABRASIVE MASK. It means easier operation for workmen, with fewer breathing spells on all types of abrasive blasting. It assures positive protection against dust, sand and shot — regardless of density or length of exposure — encountered in foundries and steel mills.

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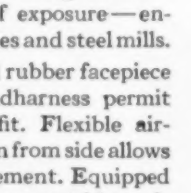
● New DURATEX HOOD protects head, neck and shoulders from abrasives.



Side view showing one-way outlet exhaust

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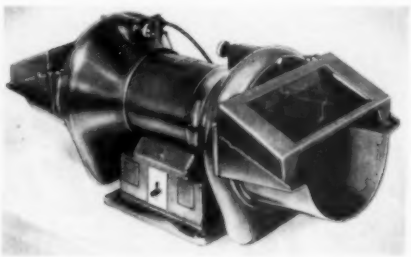
protractor tool gage slides. Tables are adjustable to any angle from 15 degrees above to 30 degrees below horizontal. Safety cup disk completely fills the open cup of the wheel and prevents injuries or dropping of tools into cup of wheels. No spray, no splash guards permit unrestricted vision but keep operator and floor dry.

Wet Grinder: Buehler Ltd., 165 West Wacker Dr., Chicago 1—Wet power grinder may be used in the shop or tool room for dressing,



touch up or the rough flat form grinding of standard tools or small parts by hand. It carries two wheels which may be had in a variety of grits, and it is available for bench or floor mounting. Manufacturer claims that the tool or part need never be removed from contact with the wheel for fear of drawing the temper. Wheels are bathed continuously in a spray of water or water soluble oil, and wide vision safety windows and flood-lighted wheel surfaces permit continuous inspection of the work. The wet wheel and surrounding moisture-laden atmosphere are said to prevent formation of dust hazards.

Magnetic Pulley: Stearns Magnetic Mfg. Co., 662 South 28th St., Milwaukee 4—Permanent magnetic pulley incorporates a special design of metal poles, is self-energized and requires no electrical cur-

rent. It is applicable for problems involving automatic removal of tramp iron from raw or processed materials, for separation of magnetic and nonmagnetic products and for reclaiming secondary metals. It is designed to be operated under all atmospheric and temperature conditions. More than 50 sizes are available from 12 in. in diam by 12 in. wide to 30 x 60 in.

Sander: Buckeye Tools Corp., 29 West Apple St., Sales Dept., Dayton 1, O.—Vertical air-powered sander weighs 8 lb, 7 oz and has an overall height of 7 in. The tool also may be used as a grinder with cup type, counter bored center wheels and cup wire brushes. It is available in free speeds of 4500, 5500, 6000, 7200 and 8500 rpm and is equipped with a governor designed to assure constant speed under load.

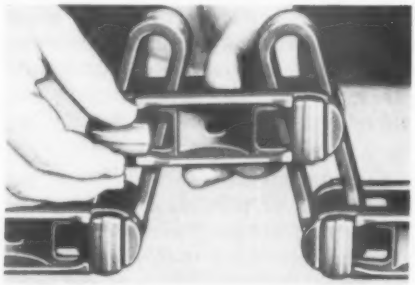
Drying Oven: Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4—Laboratory drying oven has a drying space 8 in. in diam and 6 in. in height. Overall height of the unit is 29 in. Power requirements are 2800 w at 115 or 230 v. A motor-driven fan forces filtered air past electric heating elements, and the air temperature is thermostatically controlled at any chosen drying tem-

perature between 150 and 350° F. Heated air flowing against and past the sample rapidly picks up moisture or volatile material and is said to produce a rapid drying rate. A 3-in. diam atmosphere exhaust connection is provided so that the heated air and any obnoxious fumes may be piped into an exhaust hood or duct.

Burnproof Fabric: Lester L. Brossard Co., 540 North Michigan Ave., Chicago 11 — Burnproof and heat resistant no-lint fabric has been developed to meet the need for a durable, washable and comfortable lightweight protective garment that can be worn for hours without discomfort to the wearer. The new fabric is said to have been tested, approved and used by the U. S. Navy for fire fighter suits. It is claimed that washing or dry-cleaning does not

harm the fabric, nor reduce its flameproof qualities. Aprons, arm sleeves, bibs and jackets are available in the material.

Conveyor Chain: Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4—Conveyor chain may be assembled or disassembled without tools. It has no rivets, welds or bolts, requires no special or joining links and may be disconnected at any point; yet it is said not to become disconnected or telescope in service. The



chain has three components—center and side links and the connecting pin. All parts are drop forged from high carbon steel having a tensile strength of 85,000 to 95,000 lb. Bending strains have been avoided, and the strength of the chain in position is exactly the ultimate strength of the cross sectional area of the links, it is claimed. Ultimate strength of the chain is 48,000 lb, and it is said to be capable of withstanding shock loads.

Goggle: General Scientific Equipment Co., 2700 West Huntingdon St., Philadelphia 32—Headrest goggle for use in welding, cutting and brazing operations has standard 50-mm federal specification lenses available in shades 3 through 6. Cover glasses protect the filter lenses from pitting. Plastic eye cups are

joined together flexibly so they may be fitted against the face of the wearer. Each cup has a ventilating screen and a baffle plate which prevents fogging yet keeps flying particles and stray light rays from reaching the wearer's eyes, it is claimed. Goggle assembly is hinged from the sides of the plastic headrest by telescopic arms. Concealed springs hold goggles gently against the face.

Indicating Pyrometer: Assembly Products Inc., Main & Bell Sts., Chagrin Falls, O.—Pyrometer indicators have dials calibrated in both Fahrenheit and Centigrade and are offered in several ranges for heat up to 2500° F and 1370° C. Scales are over 3 in. long, and meter case measures 3¾-in. wide and 3⅜-in. high with clear plastic front. Four ohms per millivolt gives a resistance of 212 ohms for 2500° F. Thermocouples do not need calibrated leads. Meters are calibrated for 10 ohms external resistance, (8 ohms for 500° range). A suitable resistance spool, connected in the thermocouple circuit is brought out to an extra terminal on the back of the meter. With this in the circuit thermocouples with uncalibrated leads up to 15 ft long are used. When longer leads are required, this resistance is left out of the circuit. This will accommodate leads up to 100 ft long, it is claimed.

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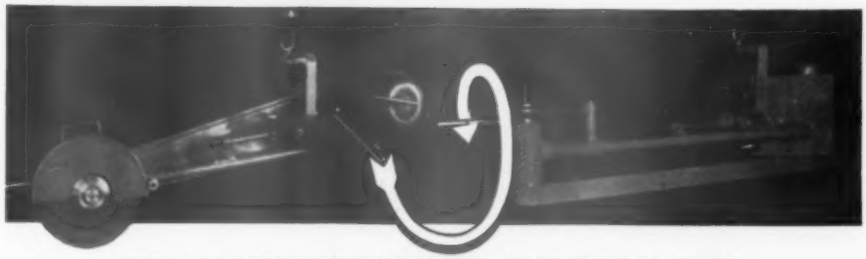

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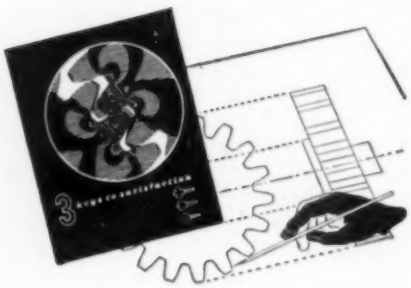

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PLANNING FOUNDRY PRODUCTION

(*Continued from page* 87)

months in the future, for all the principal productive units. Advance assignments or checks are made by the Inventory Control Section for raw material, chills, inserts, flasks, and patterns for each order. If none of these will be available in adequate quantities, arrangements are made immediately with the purchasing department, pattern and wood-working shop and others to furnish the items on the date required. The capacity is then reserved in summary form for the molding operations and a starting date is entered on the order.

After the availability of capacity, materials and supplies have been determined, the central planner figures the starting dates and time required for the remaining operations, such as coremaking, cleaning, sandblasting, and snagging, and gives the sales department a promise date for delivery. *The starting dates for all operations are then entered on the Foundry Order.*

Thus the Central Planning Section becomes the point of advance timing and co-ordination for all the foundry services to meet the time objective of the orders.

Members Work In Harmony

The Section Planning has a joint responsibility with the foreman for the day-to-day work assignments in detail, and adjustments of the long-range plan. Together, the section planners and the foreman form a well-rounded production team at the working level—the planner handling the details and paper work, the foreman reviewing the work of the planner, contributing his knowledge of the technical requirements and the ability of his men. Although adjustments to the plans are often necessary to meet conditions that arise from day to day, these adjustments are always made without seriously altering the scheduled dates of the orders involved. No change is made by the section planner which will affect the delivery date of the order.

Planning at this level is never more than three to four days in advance, in order to maintain as much flexibility as possible. Deliveries of chills, inserts, flasks, cores, and patterns from the stockrooms and other departments to the molders are arranged by the section planner as he and the foreman set the plans for the next few days.

The section planner carefully watches the progress of the plans and evaluates the effect of delays, bringing to the attention of management obstacles which cannot be overcome at the shop level.

By having the daily planning detail done by one person especially trained for the job, the foreman soon finds he has more time to devote to getting the work done, maintaining quality and developing the men under him. He knows each day without having to make an investigation of how his section stands in regard to its orders. He transmits to the planner all the information possible on day-to-day conditions, and together they work out the solutions to those problems within their scope. This is democratic planning, decentralized to gain the valuable contribution which only the shop man can give.

Inventory Control—To assure the availability of materials, supplies and tools, the methods for inventory control must be more than mere devices for recording what stock is on hand.

The methods used should enable those responsible to anticipate *well in advance what items will be in short supply so that corrective action can be taken in time to prevent a production delay.*

The idea of planning for the items of materials, supplies, patterns, etc., must prevail here just the same as in the Production Planning Sections. The methods used should be preventive instead of curative.

Space does not permit a complete description of the techniques and procedures followed in inventory control. However, to carry out the idea of inventory planning these elements must be present in the system:

1. Analysis of sales and production forecasts to determine future requirements for materials and supplies, or changes in present stock levels.

2. A stock record card on which can be determined the effect of all current and future requirements against the materials on hand and on order.

3. A tickler file by which this section can follow up the requisitions placed for the manufacture or purchase of materials and supplies before they become shortages.

4. Order points which are set by a scientific method rather than rule-of-thumb. (The order point is a point in a diminishing supply of stock at which a new order must be initiated.)

5. A method of assuring accuracy of the stock records and also initiating a requisition by making reporting of order points a responsibility of the physical storerooms as well as stores records. This is an important item.

6. Order quantities that are large enough to effect economies in purchase or manufacture, yet consistent with a minimum inventory investment.

7. Control of inventory turnover by quarterly analysis of each major class.

8. Method of pricing inventory to reflect an accurate cost of materials and supplies used.

Before orders for foundry production are scheduled and released to the producing unit, they must be entered on the stock record and a determination made of the availability of the various materials and supplies.

If adequate materials or supplies are on hand, or a date set for their arrival, the order has been cleared for scheduling.

The records as well as the top supervision of the Inventory Control Section are most conveniently located in the Central Planning office, as near as possible to the central planners. This provides a ready reference to any item required in the planning of production, as well as encouraging joint planning for both capacity and inventory.

In the Inventory Control Section itself, the philosophy and training of personnel must not only be along the lines of accurate and current recording, but also in looking beyond tomorrow to provide what is needed; to foresee the items which will cause trouble and report them to top management, so corrective action can be taken.

Foundry Orders—The basic document for authorizing all production work in the productive units of the foundry, is the Foundry Order, an example of which appears in Fig. 2. The order form is a direct copy of the Master Route Card with, of course, the addition of such information as dates, quantities, planning times, and order number.

The order states the methods and the common objective — time — to which all departments involved must work. The order tells: What is wanted, how many are wanted, when it is wanted, where it will be made, when it should be started, how long it will take, when it will be completed, what work is required, what facilities are needed, what materials, patterns, flasks, and cores are needed.

Copies of the Foundry Order are usually distributed as follows:

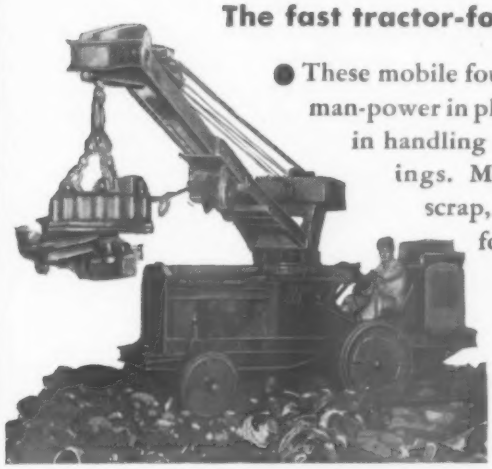
Pattern Loft—for checking availability and to act as a traveler with the pattern (and sometimes the castings).

Coreroom—for planning and progress recording.

New Efficiency and Savings in Your Foundry

ROUSTABOUT CRANES

The fast tractor-footed load-hustlers



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Many of those who visited the Tamms booth last year are now enthusiastic Tamastone users. This year they report production increases from 400% to 600% and up. This means real savings and additional profits. TAMASTONE is the ideal pattern compound that makes it possible for your own molder to make your own cope and drag patterns in your own foundry. You don't have to send them out . . . don't have to depend on others. It's easy to work with Tamastone because you need no special accelerators, retarders, vehicles and no *special* experience!

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NEW!

LITHIUM CARTRIDGES IMPROVE NON-FERROUS CASTINGS

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Lithium Cartridges eliminate all traces of entrapped gases if properly used under the right foundry conditions. This results in sounder castings.

Specifically, tensile strength and elongation are increased with attendant grain refinement.

Due to the small amount of Lithium required, this new technique is well within the economic limits of foundry operations.

These cartridges—metallic Lithium hermetically-sealed in copper tubing—come in three convenient sizes: 2.25 grams, 4.50 grams and 9.0 grams. This eliminates guesswork formulation common to some methods now in use.

Try these new Lithium Cartridges in your own plant. See with your own eyes how they can give you better castings at lower cost. Further details of these tests may be obtained without obligation by writing us today.

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Planning Section—for planning and progress recording.

Central Planner—for production recording.

If modern duplicating equipment is available, additional copies of the order are easily produced for cost keeping and other uses when required.

In the well organized foundry, no production is made without a formal authorization, usually in the form of a Foundry Order. The order forms the basic means of communication from the foundry management to every part of the organization concerned with production requirements. Without a properly designed order form, it becomes extremely difficult, if not impossible, to relate the work of the various departments to a common objective.

Reserving Foundry Capacity — When the order copies are received by the section planner, he makes certain that the cores and chills are ready for delivery, the patterns available, and that the necessary flasks are on hand before assigning the orders to a specific molder or machine. He also assures himself that work previously assigned to the molder is on schedule and that capacity is available for the work.

To determine the molding capacity available, as well as progress on work already scheduled, it has been found that Gantt charts have proved to be most effective. These charts were developed by Henry L. Gantt over a period of years and have had a wide and successful application in many industries.

Shown in Fig. 4 is a Gantt planning chart used by the Section Planner for the side floor in the day-to-day layout of work. The first column is used for the molders' names of the particular section. Three or four lines are left between each molder's name, since it is possible for a molder to work on more than one order at a time.

The large columns represent days of the week, and each day is divided into the working hours of the day. These days and hours represent capacity. The methods for reserving capacity for each order appear in Fig. 4. The chart shows that Brown is on schedule on his first two jobs, but is behind schedule on the third (C2-124 R. Stands—16 Castings). Six hours have been set aside at the end of that line to allow time to make up for the delay; the amount of time "killed" for this particular delay is indicated by the crossed lines. The symbols *PB* after the heavy progress line mean that a delay was due to a broken or damaged pattern.

Smith has two jobs delayed because of no cores, as indicated by the *C*.

Jones is ahead of schedule and can be given additional orders sooner than originally anticipated or he can help Smith when the cores are received.

Inability to start an order or make progress as scheduled is shown on the chart by the following symbols: P—no pattern; PB—pattern broken during work; C—no cores; F—no flask; H—no chills; I—no inserts; R—down for repairs; B—no bottom boards; O—no molder.

During each day the section planner takes the orders from his file by section and starting date, and reserves capacity of the class of molder called for on the order. In doing this he looks for the required molder capacity available on the starting date specified on the order for the molding operation. If the capacity is not available within two days, the order is listed on a Delay Report, described later.

Each afternoon after the planner has planned the work for the next day on the charts, he reviews them with the foreman. At that time adjustments are made where necessary to get the best utilization of manpower and to make allowances for delays, absenteeism, or other interruptions to schedule that have occurred during the day.

Prepare Daily Order

After the foreman has reviewed the plan and approves it, the planner then prepares a Daily Order of Work Sheet (D.O.W.). This sheet is the list of jobs to be done, in sequence, for each molder appearing on the chart. The jobs listed on this sheet for the next day are taken directly from the chart. In this way each molder is assigned work that is within his capacity.

Fig. 3 is a sample of a Daily Order of Work for a side floor section, which runs jobs of from one to two days' duration. The planner completes the form to the "Made Today" column, and the balance is completed by the foreman (or supervisor) of the section.

Of particular importance is the column, "Reason not started." For any job scheduled to start, but which could not be started during the day, the foreman is required to enter the reason and find out when it will start if the cause is within his power to overcome. Three important steps are accomplished:

1. The foreman learns the reason for every delay in his section and takes action on it *during the day*—not a day or two later.

2. Information on delays is passed along to the Planning Department for further action, especially on the items beyond the foreman's control.

3. Recurring kinds of delays can be discovered by reviewing and classifying those appearing on the Order of Work for one to two month periods.

Each afternoon the Order of Work sheets are collected by the planner before he starts his plan for the following day. The planner's hours usually overlap the close of the shift to allow him to get the full information or progress which plays an important part in planning the next day's work.

Use Weekly Form

For sections where the jobs are long runs, possibly lasting one or more weeks, it is more practical to use a Weekly Order of Work sheet. This saves rewriting the Order of Work each day since no new jobs will be added.

Another chart, the same in principle but kept in summary form by sections, is used by the central planner. This is the long-range chart, extending weeks into the future, and represents all planned work in the foundry. Friday is usually left open on this chart to allow for the usual delays that occur in production. It is extremely difficult, if not impossible, to get 100% utilization continually from all facilities; therefore, there must be some allowance.

As the central planner reserves time on his chart and finds he will not have enough capacity to get the orders out on time, he consults the foundry manager to decide: If a section should work overtime; if extra help will be required; if a change in methods is necessary; if extra equipment is necessary; if another shift should be started.

All this takes place *before* an order is released. By reserving the capacity well in advance, the central planner can easily anticipate the place a delay will occur if preparations are not made to alleviate the condition. In addition, he is able to give a "promise date" for the order that is accurate, because it is based on the full knowledge of the orders already scheduled to the foundry and the progress on these orders.

The chief central planner then sees that each department fulfills its obligations in meeting the scheduled

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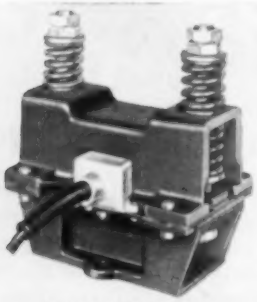

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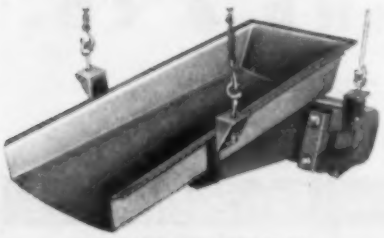

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starting dates so the orders will move through the foundry with no loss of time and are finished by the date promised.

Executive Reports—Effective executive direction depends entirely on the accuracy, clarity and promptness with which the key operating reports are prepared. These reports must be given to the executive most directly *responsible for action* before conditions are allowed to affect production.

In smaller foundries the key executives can keep in touch with conditions by means of verbal reports and a trip around the foundry. In larger foundries, however, it is impossible to see each responsible person every day and to visit the several departments, as well as keeping the trend of conditions in mind. Thus, information in a condensed and clear form of executive report, is necessary to keep key men constantly informed.

Reports on production schedules and orders are effective only when they *show in advance that predetermined conditions will not be met* unless corrective action is forthcoming.

Expected Delay Report—One of the more important reports of anticipated trouble in production is the Expected Delay Report. The entire objective of this report is to *signal management when orders cannot be started.* This is quite different from the common practice of discovering on the promised delivery date that the order is delayed. Acting on an order delayed at the "Starting Date" gives the people responsible a chance to overcome the obstacle in time for scheduled delivery.

The Foundry Order in Fig. 2 has a column (last one to the right) for the starting date of each operation. This date for starting the work is determined by the central planner with the full knowledge of the work ahead of the foundry section. Three to four days before the date to start the order, the section planner, to whom the order has been released, pulls the orders from the file (kept by starting date). He reviews the capacity available and the progress of orders already planned on his chart, and then determines if the order can be started. If it cannot be, and the reason for delay cannot be solved by the foreman and/or planner within a few days, it is entered on an Expected Delay Report (Fig.5). Three copies of this Expected Delay Report are signed by the foreman and planner; two copies are sent to the chief foundry executive controlling all operations; one copy is retained by the planner.

The chief foundry executive goes over the report and enters the action he has taken in the last column; also the new "Starting Date," if necessary. One copy is retained for follow-up, the other is returned to the foundry planner who alters his plans, if necessary, in the light of the new dates. This method enables delays to be corrected before they become critical and cause a broken promise in delivery.

Load Chart—Long-range planning in some foundries means a period of three to four weeks in the future; in others it means many months. In either case, accurate long-range planning depends entirely on a knowledge of the work ahead of each producing section for each week, and in total.

The Gantt Load Chart provides production executives with an important tool for long-range planning and forecasting production requirements. The load of work in weekly and accumulative totals is shown for each section. The chart provides the sales department with a knowledge (and incidentally a spur to selling) of time available for more orders. Also, it provides a means for more accurate promises minimizing or eliminating the chances of overselling.

Fig. 6 is an example of a load chart prepared by the central planner on May 3. The line drawn across the space for the week in the heading indicates the total amount of time reserved for that particular section. In the example, the bench section has time available (two days) in the week of May 3, but has no time available May 10.

The floor section shows that the week of May 3 has been over-scheduled (two light lines in one week's space). It is then possible to transfer molders for a two-day period from the bench section to the floor section to catch up on the over-scheduled week.

The heavy lines represent the total accumulated work ahead, which is equal to all the light lines. The accumulative lines, when compared for each section, quickly show where the load is not in balance and where equalization is required.

The Load Chart commands action from foundry management where the production sections are unbalanced. These indications usually take the following form:

1. Where, when and how much extra capacity is required.

2. What operators have less work

and can be transferred to more heavily loaded sections.

3. What equipment is continually idle and should receive consideration for disposal (or a stepped-up sales campaign for more work!).

4. What sections are likely to run out of work, and the time at which it will happen unless more orders are received.

5. When orders can be placed and promises given for delivery.

In the example in Fig. 6 the heavy lines representing the accumulated total load show that the crane floor is heavily loaded through the week of Aug. 23. In addition to the regular load of work, there is an accumulation of three weeks of orders which are behind schedule—indicated by the dotted line. In this section it was necessary to start a 6-day week for a 15-week period to make up for the work behind schedule.

The side floor is the next most heavily loaded. The weeks of May 3 and 10 are overloaded and will soon cause delays in future deliveries as promised, if additional capacity is not forthcoming.

As the bench section is lightly loaded, the decision was made to transfer to the side floor the men who had had previous floor experience. The floor is over-scheduled to the extent of about 90 man-days. By accepting no more orders for the bench section through May 24, 108 man-days of capacity can be released for side floor work.

Load Charts are usually accompanied by a one-page memorandum recommending the action necessary to equalize the load ahead. Copies of the chart and memorandum are sent to the top production and sales executives for action on the recommendations that require their authority.

Reject Reports—Scientific methods for the control of quality, in addition to providing a better product at lower cost, also increase the amount of capacity available for orders. This is a fact often overlooked in ordinary inspection and reject recording procedures.

Action to reduce defectives can come only from those responsible for production results—the worker, the foreman and the superintendent. Prompt and adequate action, however, is in direct proportion to the type of information supplied to those who are directly responsible for production.

Fig. 7 shows a "Daily Report of Castings Rejected." This report is prepared by the inspection department. It contains information on

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the previous day's production, and in many cases the same day's production, depending on the length of time required for shakeout and cleaning.

The columns headed "Pattern No.," "Operator," "Quantity by Reason" "Total Reject" and "Castings Charge" (faulty work by operator), are filled in by the inspector. At the close of the shift the report is then given to the section planner who fills in the column "Operator."

Twice a day the reports for various sections are reviewed by the foreman responsible, to determine the trend of rejects. If the quantity of rejects is unusually high, or one reason is predominant, the foreman takes down the part number and checks with the planner of the particular section to find out the molder's name. He then takes whatever action is necessary to eliminate the trouble.

The daily reports are summarized weekly by *reason* for each section and presented to the foundry executives. The report shows these totals for previous weeks, as well as for the current week, so the trend of rejects *by cause* can be seen easily.

A summary report is sent to the master route engineer who compares the actual percentage of loss with that added to the original order quantity. If the variance is an appreciable increase or decrease, and has been continuous, he changes the original allowance after going over it with the superintendent.

A copy of the daily report is sent to the section planner who, as previously described, fills in the "Operator" and "Castings Allowed" columns. In addition, he also schedules a "Make Up Order" on the quantity of rejects which were over the original allowance. The patterns will not be sent back to the loft until after this procedure has been completed.

The value of planning is in the "thinking through" of production problems in their complete cycle. Planning methods clearly define the responsibilities for production and aid the co-operation and teamwork so vital to successful operation of today's complex industries.

To look on planning as a set of techniques, procedure, forms, etc., is to see only half the picture. To see and put into practice the spirit of the methods, which stimulates participation at all levels, is to visualize planning that is democratic—the only planning that is lasting and successful.

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METALLURGICAL INSPECTION OF CASTINGS

(*Continued from page* 83)

method consists of immersing the castings in a bath of fluorescent penetrating oil for a sufficiently long period to permit the penetration of the oil into any surface discontinuities such as cracks or shrinkage areas. The castings are next sprayed or rinsed with water to wash away the excess oil on the surface. Finally, they are exposed to ultraviolet or "black" light. Under this light, the oil which has seeped into the discontinuities on the surface, will fluoresce, thus showing the location, extent and nature of the discontinuity. As an aid in speeding up the seepage of the oil from the defects, a powdered or liquid "developer" may be employed. The interpretation of the results of black light inspection may prove tricky in some cases, and experience in evaluating what shows under the ultraviolet light must be developed in order to employ this test to its best advantage. When such experience has been acquired, the test is one which is readily adaptable to production inspection on a 100 per cent basis for many castings.

Detect Hidden Flaws

Magnetic particle inspection (Magnaflux) is still another method which may be used for the detection of discontinuities at the surface or just below the surface of castings. The method is adaptable, of course, only to magnetic materials. The method consists of sprinkling iron filings or other fine magnetic particles on the casting surface and inducing a magnetic flux in the casting. When the flux lines are disturbed by the presence of a void or discontinuity, they are diverted and cause the iron filings on the surface to line up in or over the discontinuity, thus clearly outlining the size and shape of the flaw. While the size and shape of castings which can be inspected by this method may be somewhat limited by practical considerations, in those cases where it can be employed, magnetic particle inspection affords another means of accomplishing 100 per cent inspection on a production line basis.

A nondestructive inspection method has long been used for detection of subsurface defects is the radiographic method. This type of inspection can be done by means of electrically generated x-rays or by the

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utilization of the gamma rays emanating from radium; these rays are passed through the casting and onto a photographic plate or film. The rays affect the emulsion in much the same manner as light affects ordinary photographic film, so that after development the film shows light areas corresponding to the heaviest or most dense sections of the castings and dark areas corresponding to the lightest or least dense sections of the casting. Thus, the presence of a void in a uniform section of the casting will be revealed as a dark area.

Radiographs have a further value in that they provide a permanent record of the inspection which can be referred to as long as the film is kept. The method is more commonly employed on sample castings and in checking casting design and molding practice than for 100 per cent inspection—except for castings which are high stressed in service and in which even the smallest defect might prove dangerous.

Viewed on Fluoroscopic Screen

The fluoroscopic method of inspection is another in which the x-ray tube or radium may be employed to advantage. In this method, the image is viewed on a fluoroscopic screen rather than being recorded on film. The advantages of this type of inspection over radiographs are its lower cost and greater adaptability to production inspection. Its disadvantages include lower sensitivity and lack of a permanent record of the inspection results.

A comparatively new inspection method which may be applied to a fairly limited class of castings consists in passing supersonic vibrations through the casting. The transmitted, or reflected, vibrations are then converted to light waves which can be viewed on an oscillograph or oscilloscope. Two types of equipment are available for supersonic inspection. One type uses a single crystal which acts as both transducer and receiver. The second type employs two crystals mounted on the same axis, one on each side of the part being examined. In this equipment, one crystal is the transducer and the other the receiver. With either type of equipment, the presence of defects in the casting causes damping of the supersonic vibrations with a resulting change in the wave length of the light impulses which are observed on the oscillograph. By carefully covering the entire area of the casting, the size, shape, position and nature of the defects may be determined and proper remedies applied.

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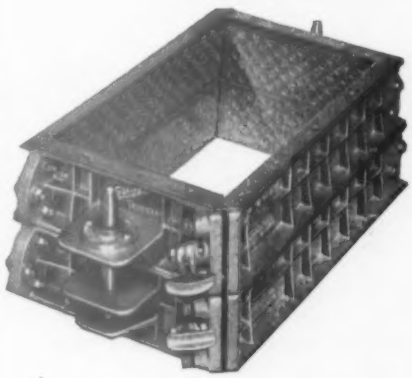

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The disadvantages of the method which make it impractical for a large segment of the casting production are threefold. First, the section thicknesses should be an inch or greater for satisfactory results. Second, the opposite sides of the section must be approximately parallel. Third, a reasonably smooth surface is required for accuracy of inspection. This last condition makes the method practicable only on large castings which are to be machined before inspection and shipment.

Test With Overload

The last nondestructive method which will be reviewed here is the one known as proof testing. This method is used on castings which are highly stressed and where the service conditions can be duplicated in the inspection department or test room. The inspection is made by subjecting the casting to a percentage overload for a short period. This assures that the casting will withstand service loads, and results in destruction of the casting if the quality is not up to standard. For this type of inspection, the castings must, of course, be tested in the same condition in which they are to be used in service. For this reason, such tests are more applicable in the consumer's plant than in the producer's. For a periodic check on castings with high quality requirement, however, the method finds some use in the producer's inspection setup.

As was pointed out at the beginning of this paper, each of the inspection methods discussed is useful to the casting producer in establishing techniques and in maintaining quality of production. On the other hand, no one method can be considered to be the complete answer to quality control.

For a well-rounded metallurgical inspection program, analytical and mechanical property inspection are indispensable, and with these methods at least two of the others should be incorporated. For complete coverage, where the resources of the particular foundry are adequate, all of the methods which are applicable to the company's products can well be employed as alternative or complementary inspection procedures to insure a high level of quality for both the producer and the consumer.

Columbia Steel Co., San Francisco, has abandoned production of commercial castings at its Pittsburg, Calif., plant. All other steel producing units of the plant will continue in operation.

CASTINGS FOR PRESSES

(*Continued from page 95*)

sition, and a central ram or piston equipped with rollers is elevated until it comes into contact with the flask. The chain is released, the vibrator mechanism put into operation, and the ram slowly draws the mold down from the pattern, which remains fastened to the machine head. When the mold reaches the level of the conveyor it is pushed off onto the other 20-ft section. From there the molds may be picked up directly by the crane and carried to the pouring floor for assembly, or pushed onto a section of roller conveyor mounted on a car, and moved at right angles to the main line for later pick up.

To indicate some of the work carried on at the Toledo foundry of E. W. Bliss Co., Fig. 2 shows the first stages in making the drag mold for the bed of one of the firm's large presses. As may be observed, part of the mold is in a pit, and the remainder in flasks above the floor level. Total depth of the drag is 10 ft, with 6 ft in the pit, and the length is 26 ft. Drag mold will be covered by a flat cope 2 ft high. When completed about 70 tons of iron will be required to pour the mold. For drying molds the firm has developed its own portable units. These are made of cast iron about 2 ft in diam and 3 ft high, and are mounted on angle iron legs about 12 in. high. Coke is used as the fuel, and the units are equipped with electrically driven blowers.

Facing Sand Varies

Figs. 7, 8 and 9 show several steps in making a mold for a press slide requiring 7 tons of iron to pour. Fig. 7 shows the cope pattern located in the flask ready to be rammed. Fig. 8 is another view after it has been partially rammed. In this view the top section of the flask has been removed to give a better idea of the numerous gaggers, hooks and bars employed to provide good sand support. Fig. 9 shows the cored-up drag mold just before closing.

Castings are produced in green sand, dry sand, and skin-dried molds. Essential difference between the processes is the facing sand mixtures employed. Base sand is 40 to 50 AFS grain fineness which also is used for cores. For green sand molds the facing is composed of 5 cu ft heap sand, 4 qt new sand, 1 qt western bentonite, 1 qt bonding clay, 3 qt wood flour and 3 qt sea-

coal. For dry-sand molds the facing is made from 10 cu ft heap sand, 15 qt new sand, 2 qt bentonite, 4 qt bond clay, and 8 qt pitch binder. For molds in which skin drying is employed the facing mixture contains 5 cu ft heap sand, 5 qt new sand, 1 qt bentonite, ½-qt clay, and 1 qt pitch. Moisture content of the facing sand ranges from 4½ to 5 per cent, and the mixing is performed in a 5 cu ft batch type muller located near one end of the foundry. Facings are transported to points by use of crane and bucket. At some areas the sand is dumped into permanently located wood boxes, while in other, such as the heavy molding floor, the buckets and contents are left where they are easily accessible to the job.

Sand Moved by Crane

Black core sand used for the large cores is composed of 10 cu ft heap sand, 2 qt bentonite, 6 qt bond clay, 8 qt pitch binder, and 2 qt wood flour. Mixed in a muller of 10 cu ft capacity at one side of the coreroom, the prepared sand is transported by crane and bucket, as in the case of the facing sands, and the buckets placed at the point of use. Backing sand for the molds includes the sand recovered in water-blast cleaning. That material is run through a classifier to remove the fines, drained and then scattered over the heap sand to be reconditioned. Reconditioning is accomplished with a portable unit which will handle 70 tons per hour.

As a part of its foundry operations, the firm maintains a well equipped laboratory for carrying out chemical and physical property determinations of the iron and other materials, as well as for testing the physical characteristics of molding and core sand mixtures. The firm is a licensee of Meehanite Metal Corp., and in addition to taking hourly wedge-bar specimens of the iron at the cupola, pours standard ASTM bars 1.20 x 21-in. bars for determination of tensile and transverse strengths of the iron. Chemical determinations of silicon, sulphur and manganese also are made hourly. Tests of the properties of molding and core sand mixtures are run several times each day.

Eastern Distributing Corp., 2219 Chamberlayne Ave., Richmond, Va., has been appointed district representative of the Foundry Equipment Co., Cleveland, for the sales of core and mold ovens in the state of Virginia.

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...TRADE PUBLICATIONS...

COATINGS: Foundry Rubber Inc., 1050 30th St., N. W., Washington 7— Folder describes four products—one for spraying green, baked or dry sand cores and molds, for chill coating and matchplates; a second for coating patterns and coreboxes; the third for spraying permanent mold, die and centrifugal casting, pig and ingot molds, pins, ladles, pots, nozzles and goosenecks, and the fourth, which is a rubber paint, for maintenance use.

LIFT TRUCKS: Clark Equipment Co., Industrial Truck Division, 258 Champion St., Battle Creek, Mich. —"Materials Handling News" pictorially and by written word tells what a fork-lift truck is designed to do. It compares the turning radius of solid and pneumatic-tired machines, explains how turning radius affects maneuverability, and discusses the principles of counterweighting.

ELECTRIC SAWS: Chicago Pneumatic Tool Co., 8 East 44th St., New York 17—Illustrated bulletin SP-3000 contains descriptive literature, specifications, and listings of equipment and blades available for the company's portable electric circular saws for cutting wood, copper, brass, bronze, lead, tile, glass, brick, clay products, concrete, marble, flagstone, asbestos, cement products and plaster board.

SPEED REDUCERS: Farrel-Birmingham Co., 344 Vulcan St., Buffalo 7—Illustrated bulletin 449 on speed reducers gives directions for selecting speed reducers of the horsepower and speed required. Contents include complete descriptions of units of the single and double reduction types, specifications, horsepower rating tables, overhung load capacities, dimensions and weights.

RELIEF VALVES: Edward Valves Inc., subsidiary of Rockwell Mfg. Co., 1200 West 145th St., East Chicago, Ind.—Bulletin 711 on forged steel relief valves contains information on dimensions and weights, design detail, and correct installation. Valves are designed for basic steam, oil, or vapor working pressure of 600 lb at 850° F, but can be furnished for more severe service conditions.

PAINT: Speco Inc., 7308 Associate Ave., Cleveland — Data sheet deals with a black industrial paint which is formulated to withstand attacks of acetic and hydrochloric acids, dilute sulphuric acids or mixtures of those acids. It is said to offer protection against the action of bleaching solutions, dilute caustic soda, ammonia or other alkaline materials.

V-BELT DRIVES: United States Rubber Co., Rockefeller Center, New York 20—Hundred-page manual to assist engineers in designing both multiple and light duty V-belt drives contains a comprehensive set of drive tables for multiple belts; complete sheave data including construction, dimensions, and weights; complete fractional horsepower drive layouts, and comparison tables with information on quarter turn drives and hexagon double V-drives.

STAINLESS STEEL: Cooper Alloy Foundry Co., Bloy St. & Ramsey Ave., Hillside, N. J.—New periodical, "Newscast," is devoted to providing information about the uses and properties of stainless steel castings. Application stories on the use of the company's alloy castings in industry as well as detailed technical data about those alloys, will be used in conjunction with special features.

GAS BURNERS: Surface Combustion Corp., 2375 Dorr St., P. O. Box 907, Toledo 1, O.—Industrial gas burner catalog describes high and low pressure equipment for all common gaseous fuels. It contains practical data on the selection of burners for most industrial heating services with the various gaseous fuels. A section on furnace design and heat input requirement calculations is included.

ALLOY SELECTOR: U. S. Reduction Co., Box 30, East Chicago, Ind.—Alloy selector in the form of a modified slide rule contains a movable center chart, showing the typical as-cast, stabilized and heat treated mechanical properties of the 23 most popular aluminum sand, permanent mold and die cast alloys.

BATTERY CARE: Gould Storage Battery Corp., 467 Calhoun St., Trenton 7, N. J.—Illustrated pocket-size handbook of instructions and engineering data on the care of motive power batteries is divided into four sections: Care and operation, maintenance and repairs, parts, and technical data.

CASTING CLEANING: American Wheelabrator & Equipment Corp., 505 South Byrkit St., Mishawaka 2, Ind. —Folder on the swing table Wheelabrator shows by illustration and statistics how the unit is being used successfully in a number of different foundries.

FORK TRUCK: Towmotor Corp., 1226 East 152nd St., Cleveland 10—Job study 85, one in a series of surveys, points out materials handling problems as they existed in a farm tractor plant and shows how the use of Towmotor equipment solved the problems and speeded up production.

DIESEL LOCOMOTIVE: General Electric Co., Apparatus Dept., Schenectady 5, N. Y.—Bulletin GEA-5183 describes and illustrates the use of standard diesel-electric locomotives for industrial switching operations. It points up economies in diesel-electric locomotive operation.

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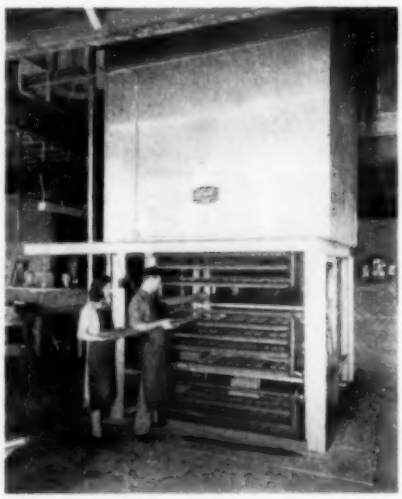

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COMPANY PRODUCTS: Murex Ltd., Rainham, Essex, England—Illustrated booklet PM-13 presents a brief survey of the activities of the various Murex companies, as well as descriptions of the metals, alloys and fine chemicals produced by the companies. Booklet is available in English, French or Spanish.

SHUTTERS AND PENTHOUSES: L. J. Wing Mfg. Co., 154 West Fourteenth St., New York 11—Bulletin SH-1 describes the company's self-closing, manually operated and motor operated shutters, and ventilating penthouses. Tables of dimensions are included.

JACKS: Templeton, Kenly & Co., 1020 South Central Ave., Chicago 44—Bulletin "Industrial 49" provides complete specification charts, selection guide and price listings on the company's lever, screw and hydraulic jacks, and related equipment. Prices are included.

TRAILERS: Mercury Mfg. Co., 4036 South Halsted St., Chicago 9—Bulletin A-999 describes and illustrates the various types of company trailers and lists specifications of each. It discusses the use of trailers in the "trackless train" system.

DUST COLLECTORS: Torit Mfg. Co., 303 Walnut St., St. Paul 2—Catalog 34 provides information on self-contained and cyclone type dust collectors and outlines methods for collecting and cleaning dust laden air from around industrial machines.

CORE BLOWER EQUIPMENT: Eastern Clay Products Inc., Jackson, O.— Leaflet discusses plastic blow tubes, wear inserts and wear strips for use in coreboxes, flow plates and similar applications. Information on properties and application is included.

REFRACTORIES: Babcock & Wilcox St., New York 6—Bulletin R-22 on refractory castables, plastics and mortars describes the products, outlines their characteristics, and indicates typical applications.

POWER RIDDLE: Roller Riddle Corp., 3127 Goulden St., P. O. Box 295, Port Huron, Mich.—Folder describes sand riddling machine that is said to riddle enough sand to cover an ordinary pattern plate in three seconds. Prices are shown.

BLOWERS: Lindberg Engineering Co., Air & Hydraulic Division, 2444 West Hubbard St., Chicago 12—Illustrated bulletin 740 describes features of the company's blowers and includes a chart of sizes and specifications of blower units.

STEELS: Jessop Steel Co., Washington, Pa.—Catalog describes the analyses, heat treatments and applications of five most commonly used types of high-speed steels. Charts showing the hardness values after heat treatment are included.

TESTER: W. C. Dillon & Co., 5410 West Harrison St., Chicago 44— Bulletin M describes the company's universal tester and its operation. Photographs of all parts are included.

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Any operator can quickly determine temperatures of minute spots, fast-moving objects and smallest streams with the simplified PYRO Optical Pyrometer. Proved in actual use . . . foundrymen swear by it!

SELF-CONTAINED—DIRECT READING—No correction charts, accessories or upkeep needed!

ACCURATE—"Special Foundry Type" and "Triple Range" models also have Red correction scale to determine *true spout* and *pouring* temperatures of molten steel and iron when measured in the open.

LIGHT IN WEIGHT—Weighs only 3 lbs. complete.

AVAILABLE IN 5 RANGES from 1400° to 7500° F.

Write for FREE CATALOG #80

For Better Temperature Control in Non-Ferrous Foundries

PYRO IMMERSION PYROMETER

Accurate temperature control is a must to assure low cost production of UNIFORM, SOUND CASTINGS. That's why the new PYRO Immersion Pyrometer is indispensable in any modern non-ferrous foundry—in crucibles, ladles and furnaces.

The PYRO Immersion Pyrometer is shock-proof, moisture-proof, dust-proof and immune to magnetic influences. Withstands roughest handling. Shielded steel housing. "Protected Type" and "Bare Metal" thermocouples interchange instantly without adjustment or recalibration. Large, 4-inch scale is easy to read. Has exclusive LOCK SWIVEL. Ranges 0-1500 and 0-2500° F.

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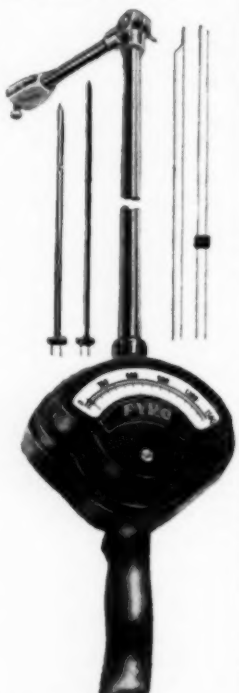


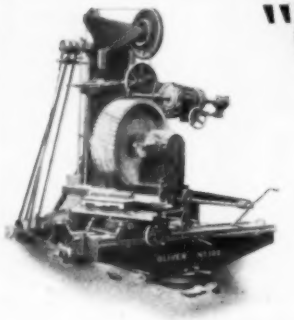
See our Exhibit at Booth No. 613—I.S.A. Convention

THE PYROMETER INSTRUMENT CO.

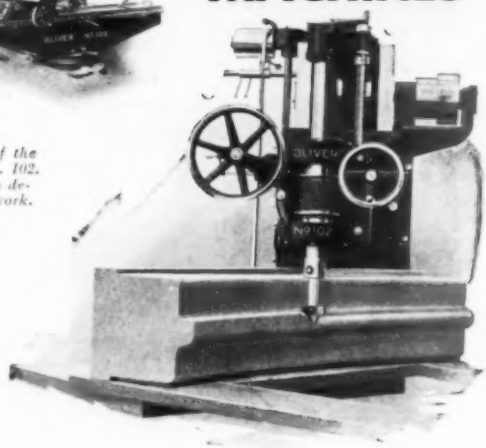
New Plant and Laboratory

BERGENFIELD 6 NEW JERSEY

"OLIVER" PATTERN MILLING MACHINES



Two views of the "Oliver" No. 102. At right is a detail of the work.



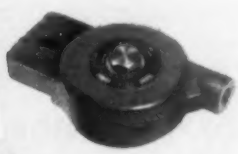
Cut Production Time 25%

Cuts patterns for spiral, spur, bevel, worm gears at savings of 25% in time. And finishes core boxes at savings up to 75% in time. Does accurate, excellent work. Unlimited capacity. Used by leading engineering firms throughout the world.

Write for Bulletins 102 and 103.

OLIVER MACHINERY CO., GRAND RAPIDS 2, MICH.

AMAZING VIBROLATOR



QUIET — SPRINGLESS — SELF-STARTING

GUARANTEED not to jam, stick or fail to start

PROVED in the world's most modern foundries

EXCLUSIVE self lubricated feature needs no oil or attention

GREATEST power for weight ratio of any vibrator

BEST all-directional vibrator ever built

CUTS COSTS, saves time out for repairs, saves air

IMPROVES draw because it is light in weight, has better balance

MARVELOUS self cleaning feature ejects water, sand, scale and muck

IMMEDIATE DELIVERY—ORDER NOW!

Order one size smaller than conventional vibrators

⅜", $7.00; ½", $9.00; ⅝", $11.00; ¾", $13.00; 1", $15.00; 10 CV, $17.50; 10 MV, $17.50.

See Your Foundry Supply House or Send For Circular

MARTIN ENGINEERING COMPANY

Kewanee 2, Illinois

BUCKEYE "3-in-1" FLASK GUIDES *Again Improved!*

NOW — Four New Features for more assurance of Perfect Lifts!

BUCKEYE "3-IN-1" Flask Guides, featuring the exclusive 3-V pins, slides and match plate lugs (all interchangeable), have again been improved in four ways!

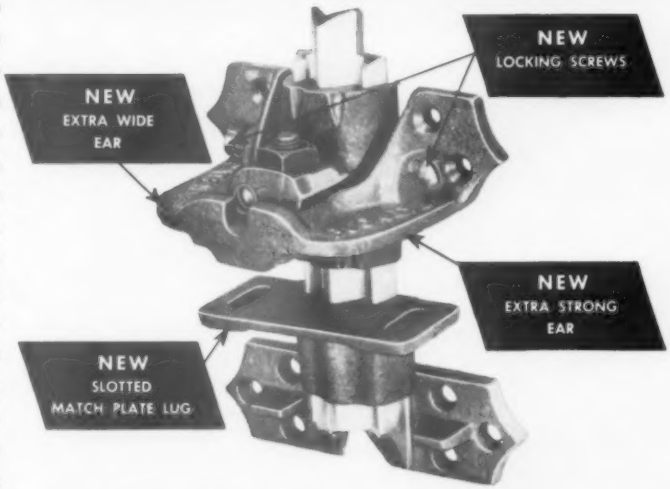
1. Two *new* Locking Screws, one at each side of the ear, hold slide more firmly against pin—give a 3-point locking arrangement — assure perfect and permanent alignment.

2. The *new* extra strong Ear affords maximum strength to withstand jolting and squeezing operations without cracking or straining.

3. Increased width of the *new* Ear provides molder a better grip—easier lifting of the cope! *New* Ears can replace old-style Buckeye ears without alteration.

4. *New* Match Plate Lugs come to you slotted for easier, faster attachment to the match plate, and correct adjustment to the pin.

These new features mean a better, more rigid flask guide assembly. Available for straight or tapered flasks in 3, 4, 5, 6, 7 and 8" lengths. Metal wedge plates available for tapered flasks in 3°—4°—5°. Write for full details and prices—today!



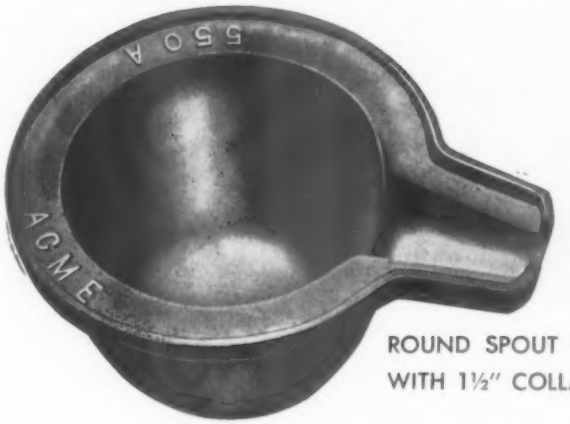
THE BUCKEYE PRODUCTS COMPANY

7029 VINE STREET — CINCINNATI 16, OHIO

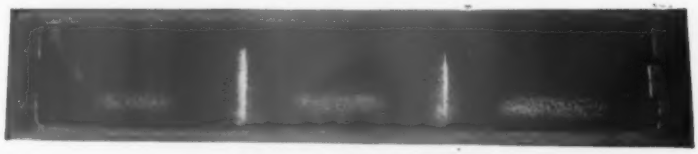
Manufacturers of Core Oil • Parting • Core Compounds • Core Wash • Refractory Cements

MELTING POTS—Ingot Molds

for ALUMINUM AND OTHER NONFERROUS METALS. 45 SIZES.



ROUND SPOUT POT NO. 550A
WITH 1½" COLLAR ON FLANGE



INGOT MOLD NO. AA-6

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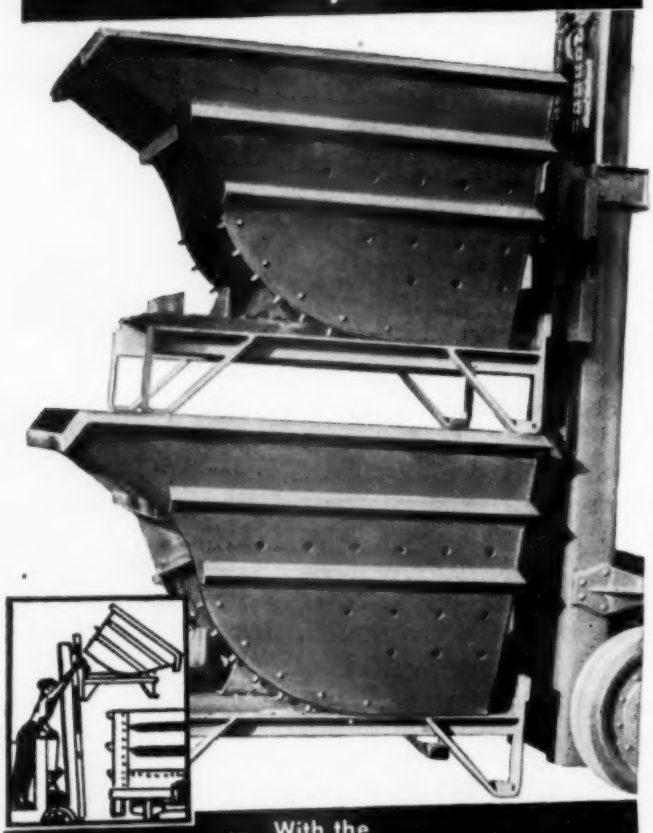
HOLDING BOWL
NO. HP7001

Made of Acme SPECIAL-M-Heat Resisting Iron — They Stand the Heat!

ACME FOUNDRY COMPANY

2502 22nd Street — DETROIT 16, MICH. — *Phone:* Tashmoo 5-2404

Save 50% LABOR-TIME and $pace



With the *self-dumping* **ROURA HOPPER**

Exclusive Instant Release (Patent Pending) Handle Speeds Dumping from Lift Truck

Handling wet or dry, hot or cold, bulky materials quickly and easily, the ROURA is simple to operate—only one man is required for distributing and unloading—and he does this in much less time than ordinarily required under old-fashioned manual methods. Thousands of Roura Hoppers (which fit any standard fork or platform lift truck) are in constant daily operation, serving and saving for such firms as Owens-Illinois Glass, Corning Glass, National Fireproofing, General Motors, Ford, Chrysler, American Brake Shoe, General Electric, Westinghouse, Western Electric, American Steel Foundries, International Harvester, John Deere, etc.

By a simple lift of the exclusive release handle, the ROURA HOPPER dumps, rights and locks itself securely. Sizes—½, ¾, 1, 1½ and 2 cubic yards; the ROURA HOPPER can also be designed for flat trucks and in other sizes to meet specifications. Also, it can be equipped with special flanges that permit stacking to desired tiers for storage or future distribution of materials—conserving valuable floor space. Priced below all competition, the ROURA will quickly pay for itself many times over.

Write today for detailed brochure.
"You Can Save 50% Labor-Time"

ROURA IRON WORKS, Inc.

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T-M ALLOY CHAIN

WILL LIFT YOUR PROFITS TOO!

—LONGER LIFE
—LOWER MAINTENANCE COSTS
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TM Alloy Steel Chain will ably meet your lifting needs *and show a marked effect on your profits too.* Extra strength means added safety. It never requires annealing or periodic heat-treating. These factors plus its ability to withstand shock, grain growth and work-hardness result in lower maintenance costs—lower replacement costs and *TWICE THE SAFETY FACTOR.* See your local mill supply distributor or write direct for literature and specifications.

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75th ANNIVERSARY

MANUFACTURERS OF BBB, PROOF COIL, HI-TEST AND STEEL LOADING CHAIN

BLYSTONE • MIXERS •

THE paddle-type mixer for core sand mixing in the foundry. Blystone Mixers offer: low mix cost, thorough mixing, and easy operation. There is a sturdily built type and size for your problem. Send for Bulletin and full details.

• BLYSTONE DIVISION •
STANDARD SAND & MACHINE CO.
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BLOOMSBURY BLACKING

Has stood the Test of Years—67 to be exact—and still the favorite wherever Clean Castings decide the preference.

"BLOOMSBURY QUALITY— Guarantees Clean Castings"

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From Pig's Ears to Oysters . . .

From Flue Dust to Ingots

THE BUTLER CARSCOOP

Handles Them All!

Not only handles them but handles them at a big saving in cost.

Pig's ears, oysters, battery plates, coal, cement, sand, — in fact all sizes and kinds of granular materials. There are mighty few things the CARSCOOP hasn't been called upon to unload and carry.

The CARSCOOP's amazingly efficient scooping-action, — its unparalleled agility in working in cramped quarters, its extremely short turning radius (6 ft. 6 in.) and its large capacity scoop (10 cu. ft.) unquestionably makes it the world's fastest car unloader.

The Butler CARSCOOP may solve your materials handling problem, — just as it has for hundreds of the country's largest industrial plants. It's certainly worth your investigation. There's complete information awaiting your request. Write today.

BUTLER BIN CO. WAUKESHA, WISCONSIN
CARSCOOP DIVISION

Sales Representatives in Principal Cities and Foreign Countries

LIFT A HANDLE AND *Presto!*

YOU'VE GOT AN ACCURATE

BRINELL *Impression*

It's just that simple to operate this advanced hardness-testing machine—especially designed for small shops, laboratories, heat-treat plants, schools, foundries, etc. It's called the

Model J
(Manually operated—dead weight type)

BRINELL TESTING MACHINE

Model J requires no laboratory technique—you lift the handle to apply the load—you bring the handle forward and down to raise the weights and release the part. No maintenance trouble or expense, nothing to get out of order—few moving parts. Accurately calibrated for loads of 3000—2500—2000—1500—1000—500 kilograms. Other valuable and exclusive features. Available in bench model or floor model—also motorized. Write for descriptive leaflet.

PUT YOUR TESTING PROBLEM UP TO US

We have the machine you need, or can produce it. Full line of Brinell hardness, transverse, tensile, ductility, compression and hydrostatic testing machines. A 30 year record of successful accomplishment for American industry. Write for information on our entire line or send us details of your problem.

Steel City **TESTING MACHINES, INC.**

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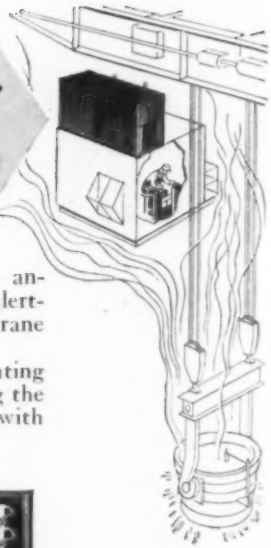
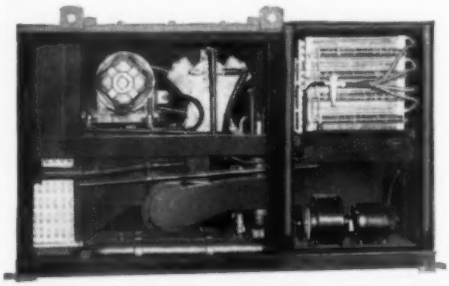
DRAVO CRANE CAB COOLERS

REDUCE OPERATING HAZARDS



● Excessive heat, obnoxious fumes, annoying dust and moisture reduce the alertness and efficiency of your hot-metal crane operators.

● You can eliminate these crane operating hazards by completely air conditioning the cabs on all types of hot-metal cranes with Dravo Crane Cab Coolers.



Completely self-contained Dravo Crane Cab Cooler requires electrical connection only.

DRAVO CORPORATION

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DOUBLE YOUR PRODUCTION—with the fastest and most powerful Rammer made—

NO. 4 DAYTON RING VALVE BENCH RAMMER

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Aside from its efficiency, the chief advantage of this Rammer lies in its long life. The Valve Unit will last for years without repair or replacement. The Cylinder Bore and Piston Rod are HARD CHROME PLATED, features which double the life of the Rammer and reduce maintenance costs at least one-half.

Have been adopted as standard by some of the largest users of Rammers throughout the Country. MADE IN FIVE SIZES. Send for Bulletin No. 300.

DAYTON PNEUMATIC TOOL CO., DAYTON, O.

The Foundryman's "GOOD RIGHT ARM"

HERE's a Blaw-Knox Single Line, Hook-On Type Bucket favored by many foundries. Size No. 0-3100 rated 1¼ cu. yd. does an efficient job of handling moulder's sand, coke, slack coal or other loose bulk materials. Equipped with Safety Hub Trip . . . Fully described with many other foundry type buckets in Catalog 2232. Copy on request.

BLAW-KNOX DIVISION
OF BLAW-KNOX COMPANY
2097 Farmers Bank Building, Pittsburgh 22, Pa.

If low headroom is a factor, Blaw-Knox can supply a bucket that operates in only 6'7"!

BLAW-KNOX FOUNDRY BUCKETS

Improve YOUR CASTINGS with THESE INSTRUMENTS

PERMMETER

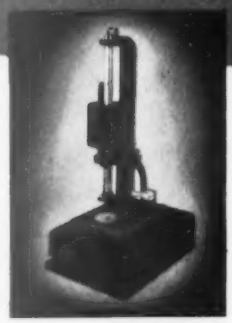
With the Dietert-Detroit Permmeter, you can measure the permeability of foundry sand, core or mold coatings, investment materials, refractories and other materials.

Permeability is read directly through the range .17 to 500 and with a stopwatch up to 2000. The Permmeter does not get out of calibration, and it eliminates the chance of human error.

GREEN CORE IMPACT TESTER

Reduce core makers' complaints on the workability of core mixtures by proper material selection and control. Use Dietert-Detroit Green Core Impact Tester for measuring the resistance of a green core to sagging and cracking, ability to carry overhang and ability to roll-out onto core plate. The results of the test quickly indicate faulty core sand mixtures which can then be corrected to assure greater core accuracy and continuous production of good cores by core makers with minimum skill and care.

SAND RAMMER REACTION BASE



The Sand Rammer Reaction Base assures uniformity of rammed sand specimens regardless of the location of the rammer or the foundation on which it is mounted. Thus, permeability and compression strength readings are more uniform and comparable from day to day than with those made in other laboratories.

Write to Department 7 for complete specifications

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CONTROL EQUIPMENT • SAND • MOLD • MOISTURE • CARBON • SULFUR

★ Sharper Castings
★ Greater Brinell Hardness
★ Increase Tensile Strength
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Copper Shot

IMPROVES YOUR IRON

ALTER COMPANY Fifty Years of Service

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SAVE "DOWN TIME" AND REPAIRS

OPERATE AIR TOOLS WITH

CLEAN DRY AIR

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USE MURPHY SEPARATORS

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Employing four positive principles of separation, the Murphy "Type A" Separator carries a money-back guarantee to deliver clean, dry air to point of use. Completely automatic separation and ejection. No moving parts to receive wear. No filters to renew. Requires neither attention nor maintenance. Install it . . . and forget it; it's guaranteed. Write for literature and prices.

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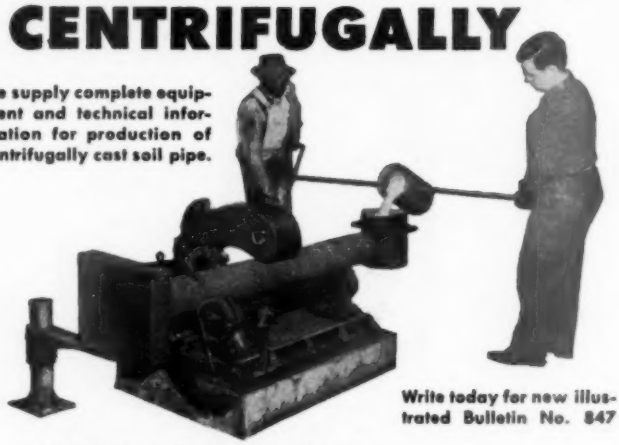
FIFTH AND VINE STREETS, HAMILTON, OHIO
Moisture Elimination Up To 3000 Pounds Per Square Inch

CAST SOIL PIPE CENTRIFUGALLY

We supply complete equipment and technical information for production of centrifugally cast soil pipe.



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This Modern Method Provides for:

- Production Uniformity
- Perfectly Concentric Pipe
- No Sand Blasting or Other Cleaning Necessary
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- Small Man-Hour Labor Cost
- High Production with Low Investment
- Pipe Sizes from 2-inch Diameter Upwards

CENTRIFUGAL CASTING MACHINE CO.

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HIGH PRODUCTION MELTING FURNACE

with plenty of "PLUS"

ECLIPSE "RB" Crucible Furnace

For heavy foundry production in melting brass, bronze, aluminum and other alloys, this Gas-Fired Eclipse Crucible Furnace meets every requirement—and in addition has many "plus" construction features that make it unusually practical and economical.

+1 **Sturdy Shell Construction:** The furnace shell is heavy sheet steel with welded seams reinforced with flat stock band to eliminate top distortion. Shell bottom is constructed of heavy plate raised off floor to provide proper ventilation under furnace.

+2 **Lining:** The highest quality of refractory materials is used in the furnace lining to give a lining of long endurance.

+3 **Cover Construction:** The roll back cover provides a tight-fitting seal between furnace and cover and helps keep floor space to a minimum. Heavy cover frame work and roller rails combine to make a durable cover arrangement.

+4 **Burner and Mixing Equipment:** The burner equipment supplied on this type of equipment consists of a McKee Special Walltite burner designed for high production melting. Proper air-gas ratio adjustment is maintained by using a McKee Low Pressure Proportional Mixer. Regulation of heat imput is easily controlled by the single valve control of mixer.

The Eclipse line of Gas-Fired, Non-Ferrous Metal Melting Furnaces includes a size and type to fit your foundry needs. Write for Bulletin C-2 describing various models of crucible furnaces, with full specifications.

Eclipse Fuel Engineering Company
ROCKFORD ILLINOIS
McKee Eclipse

M·S·A *Industrial* FIRST AID CABINET

A complete First Aid Cabinet for the foundry, in a sturdy steel wall-mounted cabinet. With assortment of materials meeting the various state compensation requirements, dressings are instantly located when needed and easily removed. A comprehensive first aid manual is included. Write for Bulletin FA-90.

M·S·A FOILLE BURN SPRAY KIT

This specialized Burn Spray Kit is always ready for instant service. Containing an ample supply of famous Foille for Burns, in jars which screw directly to spray gun, rapid coverage of burn injuries is enabled with a few strokes of pump—quickly relieving pain, preventing shock and infection, and promoting faster healing. Dressings, sterilized sheet, scissors, etc. are included in weather-proof steel case. Bulletin FA-89.

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Braddock, Thomas and Meade Streets · Pittsburgh 8, Pa.
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INSTALL THIS
NEW SAFETY DEVICE NOW!

Recommended and Approved by FACTORY MUTUAL
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NORWALK CUPOLA BACK PRESSURE VALVE

NORWALK
CUPOLA CHECK VALVE
FACTORY MUTUAL ◀FM▶ APPROVED
NORWALK VALVE Co.
SOUTH NORWALK, CONN.

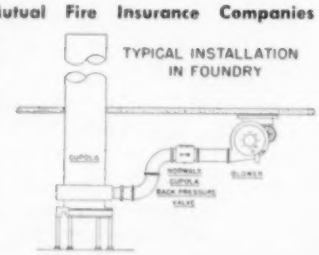
for cupola air lines

PREVENTS production interruptions because of blower damage; prevents back flow of combustible gases into piping blower and foundry itself.

A major factor in foundry explosions is failure of the human element. The man in charge of cupola operation forgets to close the blast gate in the air blast line to the cupola, following shutdown of blower during a melt. Combustible gases then find their way through the windbox air blast piping and blower into blower room and foundry, instead of upward through charge and out stack.

Associated Factory Mutual Fire Insurance Companies recommend the Norwalk Cupola Back Pressure Valve to guard against this potential explosion cause . . . failure in the human element.

Write for recommendations on guarding yourself against interrupted production this easy low cost way.



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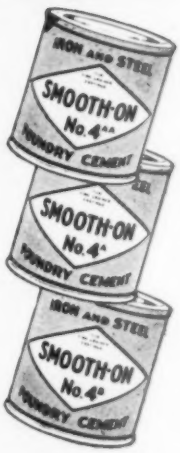
WHITING CORPORATION
NORWALK VALVE COMPANY
SOUTH NORWALK, CONN.

WHAT THE
"Well-Dressed"
CASTING
Should Wear

When a casting's "complexion" isn't quite perfect, make pock marks, shallow sand holes, blow-holes, etc. practically invisible with Smooth-On No. 4 Foundry Cement. Thousands of foundries today finish their castings this way. Smooth-On expands slightly as it sets, hardens like the casting metal, stays tight, may even be filed. Three shades to choose from.

Match LIGHT GRAY castings with Smooth-On No. 4AA. 1-, 10- and 50-lb. sizes . . . Match MEDIUM GRAY castings with Smooth-On No. 4A. 1-, 5-, 25- and 100-lb sizes . . . Match DARK GRAY castings with Smooth-On No. 4B. 1-, 5-, 25- and 100-lb.



FREE SAMPLES
REPAIR HANDBOOK

If your supply house hasn't Smooth-On Foundry Cements, write us. If you've never tried them, we'll send you generous FREE SAMPLE to test. Specify shade preferred. We'll send also FREE 40-PAGE REPAIR HANDBOOK full of other valuable repair ideas. Send TODAY.

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FOUNDRY CEMENT

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FULLY MACHINED PATTERNS and CORE BOXES
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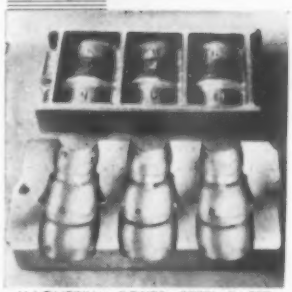
PLASTIC •PLATES •PATTERNS •CORE BOXES

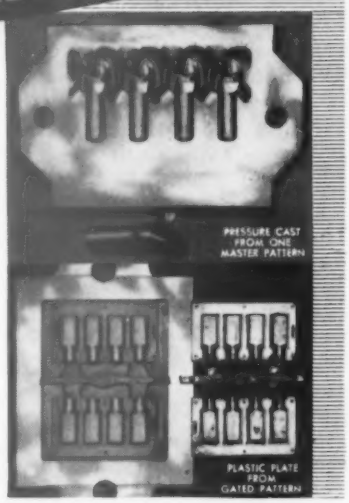
PERMANENT MOLDS and DIES

Non-ferrous Sand Castings . . . Zinc and Aluminum Die Castings

CENTRAL PATTERN CO., QUINCY, ILL.



MAGNESIUM BOXES, STEEL FACED



Practical tips on faster grinding

Six Sets of Bearings give you extra service

Desmond's exclusive Hex dressers (with standard Desmond-Huntington cutters) give you fastest dressing action plus the time and money-saving feature of 6-hole bearing blocks. When one set of bearings gets worn, loosen cap screws, pull blocks out and insert them again into the pin in the next pair of bearings. Call your industrial distributor. Desmond-Stephan Mfg. Co., Urbana, Ohio.

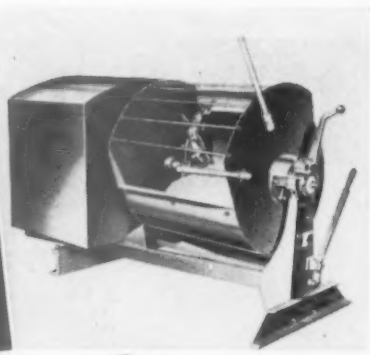
Desmond

the only complete line of grinding wheel

DRESSERS & CUTTERS

BALL BEARING DRESSERS | REVOLVING CUTTER TYPE DRESSERS | DIAMOND HAND TOOLS AND NIBS | WHEEL TYPE DRESSERS | SIMPLEX STEEL-SLIDE VISE

WONDER Sand MIXERS



New Mixing Efficiency

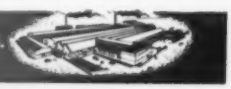
EXCLUSIVE TRIPLE MIXING HOES . . .

Tops in the field! Triple mixing Hoes have adjustable blades . . . easily set for correct clearance. Mixing is *thorough* and "end to end". Advance CMC design makes charging and discharging *easier than ever before!* 6 cu. ft. capacity shown. Write today for full details.

RENEWABLE DRUM LINERS

Easily, replaceable full-hard abrasion resistant alloy steel drum liners are your assurance of lowest upkeep and minimum operating costs.

CONSTRUCTION MACHINERY CO'S. WATERLOO, IOWA, U.S.A.



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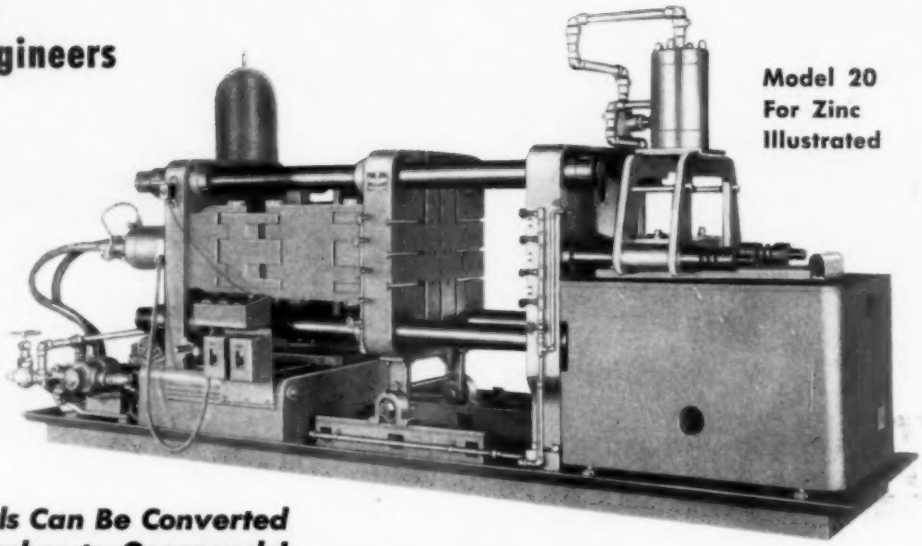
CAST-MASTER *Die Casting Machines*

Precision Built by Die Casting Engineers

● Cast-Master Die Casting Machines are designed and built by engineers with years of experience in the Die Casting Industry. Each model has been given months of actual operation under the most severe conditions. You'll find a CAST-MASTER geared for years of trouble-free operation plus high speed production at a minimum cost.



Model 20 For Zinc Illustrated

All Cast-Master Models Can Be Converted From Cold Chamber to Gooseneck!

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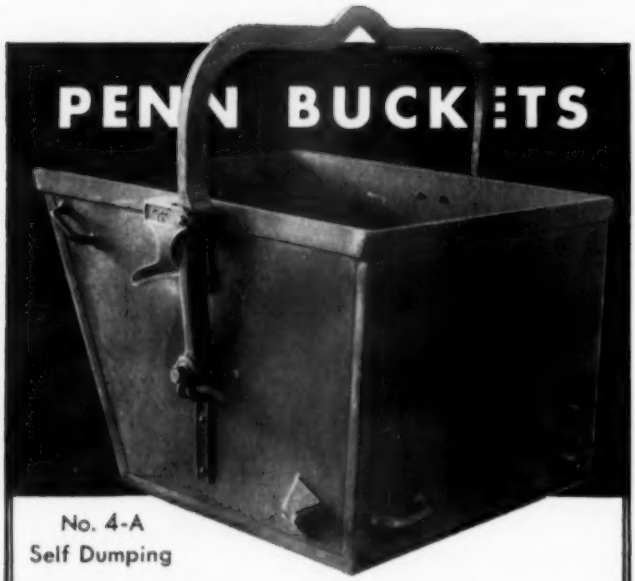
Send for New Catalog Showing Complete Line of Cast-Master Die-Casting Machines.

PENN BUCKETS



No. 4-A
Self Dumping

Careful balancing makes Penn Buckets self dumping when loaded and self righting when empty. Welded construction prevents "clinging" makes them empty easily and completely.

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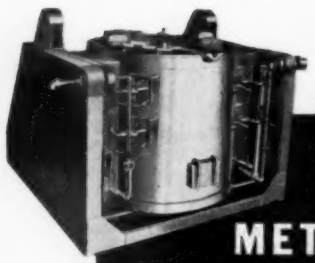

'Surface'
NON-FERROUS
METAL MELTING FURNACES

SELECTION TABLE

	TYPE	Max. Temp.	Series	Recommended for	Bulletin No.
TILTING	CRUCIBLE	2500°F.	TCR	Melting Brass and Copper	TC-45
		1400°F.	TCA	Melting Aluminum	TC-45
	POT	1400°F.	TP	Melting Aluminum and Magnesium	TP-45
STATIONARY	CRUCIBLE	2500°F.	CR	Melting Brass and Copper	CR-45
		1400°F.	AC	Melting Aluminum	AC-45
	POT	1400°F.	AM	Melting Aluminum	AM-45
		1200°F.	SM	Melting Soft Metals	AM-45
		1000°F.	SA SAV	Melting Soft Metals	SV-49

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GREY IRON CASTINGS

ONE OF THE NATION'S
LARGEST AND MOST MODERN
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ESTABLISHED 1866
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BLACKEN MOLDS
FASTER AND BETTER
with the
MURPHY PISTOL SPRAYER
ELIMINATES SWAB, BRUSH and SPRAY CAN

BLACKENING REACHES HIDDEN POCKETS
MOLDS ARE BLACKENED FASTER
CASTINGS PEEL BETTER
WORK COMES CLEANER
Satisfactory Performance Guaranteed or Money Back

PRICES COMPLETE WITH SUCTION HOSE AND SINKER

PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
PRICE F. O. B. HAMILTON, O.	$12.00	$12.00	$12.00	$14.50	$18.00

Used for Silica wash, oil, water or any liquid material. For sand-blast cleaning. As a blow gun for cleaning motors and machinery. If your dealer cannot supply you at once, order direct from manufacturer below. Literature on request.

GUARANTEED COMPRESSED AIR PRODUCTS

AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS
JAS. A. MURPHY & CO.
FIFTH AND VINE STREETS, HAMILTON, OHIO
Moisture Elimination Up To 3000 Pounds Per Square Inch

Where you have heat, smoke and fumes in concentrated quantities, it takes *power* to expel these elements fast enough to clear the atmosphere for greatest comfort. Swartwout Ject-O-Valve forces contaminated air outside before it spreads through workrooms—draws *fresh* air in from outer walls.

Ject-O-Valve (patent applied for) is sturdy, powerful, efficient. It literally "throws" bad air *out* and *up*. The top is open only when fan is running. Weatherproof at all times. Made in 5 sizes, 28 capacities—6,400 to 46,500 C.F.M.

It pays you to have this flexible ventilation facility, to help keep workers satisfied, more efficient. Write for full information.

THE SWARTWOUT COMPANY
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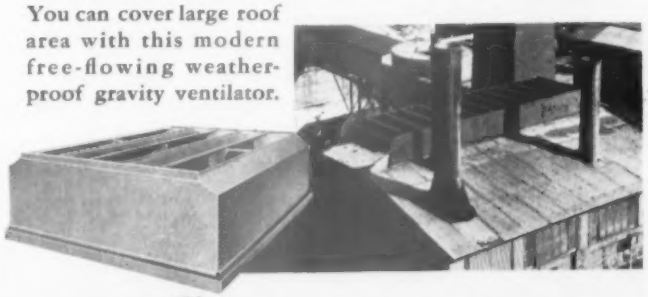
Swartwout *AIRMOVER* for "open roof" ventilation

You can cover large roof area with this modern free-flowing weatherproof gravity ventilator.



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Controlled **Air Circulation**
EQUIPMENT FOR EFFECTIVE ECONOMICAL VENTILATION OF INDUSTRIAL BUILDINGS

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ALL CAPACITIES • ALL TYPES

Including Timken worm geared Ladles with *Industrial's* patented distortion-proof, self-locking design

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WELDED STEEL
RIVETED STEEL

Including

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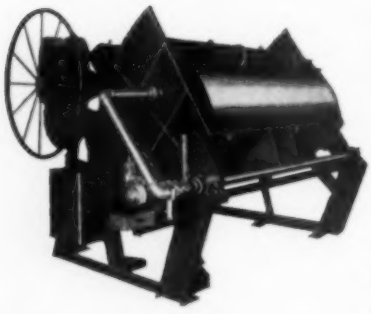

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Special geared motor-driven mixing ladle, an example of custom-build pouring and handling equipment available at INDUSTRIAL

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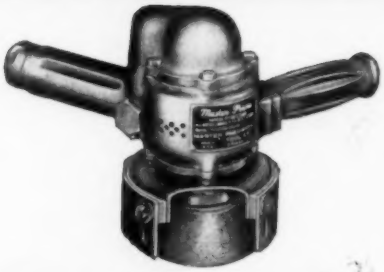

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because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

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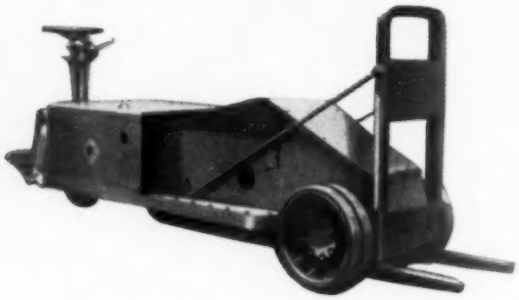

ELWELL-PARKER FURNACE CHARGER, Type LF, capacity 6,000 lbs., with new PHILCO type XV-21, 15 cells battery, completely re-built with 60 day guarantee.

300 Lift truck platform skids, 9 ga. corrugated steel, 42" x 48" x 12" high legs, 11 ga. floor channel runners, reinforcing leg lugs.

FORK LIFT and PLATFORM TRUCKS, gas and electric, 2,000 to 10,000 lbs. capacity.

ELWELL-PARKER Model ELN-10 Die Handling Gas-Electric Platform Truck, 5 ton cap.

GRAVITY CONVEYOR—all sizes

INDUSTRIAL HANDLING EQUIPMENT CO.
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ELECTRIC MELTING FURNACE

Removable roof has 4-point support for lifting, to reduce refractory-damage due to warping.

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CARBON BONDED CRUCIBLES AND SILICON CARBIDE REFRACTORIES INCLUDING FURNACE COVERS FURNACE LININGS BASE BLOCKS AND REPAIR CEMENT

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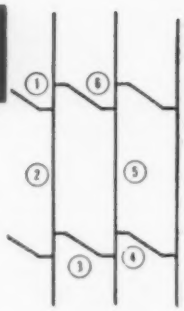
7 STAVES INTERLOCK



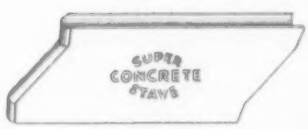
Each Super-Concrete Stave in a Neff & Fry Silo interlocks with six contiguous ones. The edges are grooved and beaded. The joints are so secure that grouting is not necessary, although a mastic filler is used when damp-proofing is specified.

Due to the diagonal joints, reinforcing rods impinge upon both ends of all staves. As many additional rods are drawn around the bodies of the staves as needed to resist lateral pressure.

This patented design makes the N & F Silo a structure of distinctive strength and solidity. The corrosion-resistant materials assure long life with virtually no maintenance cost.

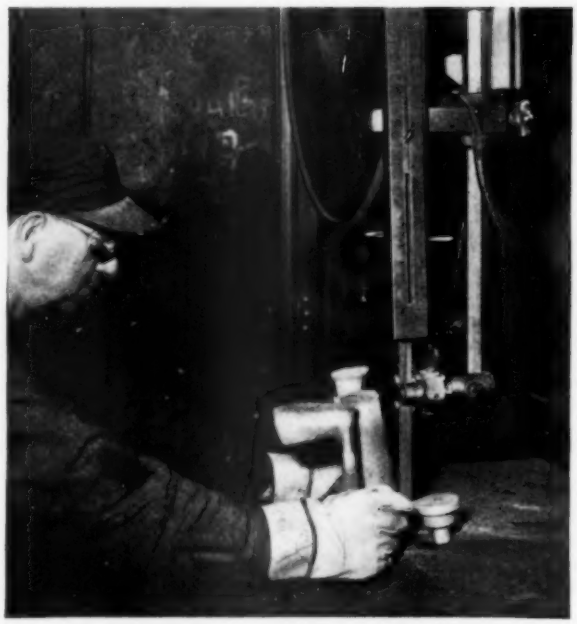
It will pay you to get complete information. Write, wire, or phone.

THE NEFF & FRY CO., Camden, Ohio



NEFF & FRY
SUPER-CONCRETE STAVE
STORAGE BINS
FOR ALL SORTS OF
FLOWABLE BULK MATERIALS

ATLANTIC Band Saws



The Favorite Blades of Non-Ferrous Foundries for Over 20 Years

You will profit by using the tougher Atlantic blades for clean, speedy cutting of gates and risers from castings. You can eliminate unnecessary grinding operations—our specially milled tooth construction makes it easier to cut closer to the body of the casting. All Atlantic Metal Cutting Band Saws are guaranteed as to material, workmanship and temper.

Send for Atlantic Band Saw Catalog,
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DRAVO *Counterflo* HEATERS

You do only HALF the job of foundry ventilating when you exhaust smoke, fumes and airborne dust. Do a 100% job by supplying clean, fresh, tempered replacement air with Dravo *Counterflo* Heaters. These same units will provide ample plant ventilation in summer.

Gas or oil-fired . . . readily converted from one to the other. Stainless steel combustion chamber. Up to 22,000 CFM air-handling capacity per unit. Directs warm air to the working zone without drafts. Easily installed—only power line, fuel pipe and stack required. Floor, wall or ceiling mounting. *Greater employee comfort means greater production.* Write for Bulletin LX-523.

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The "Waterlox Way" is a proven production economy measure. You can virtually eliminate rejects and "weeping" castings by impregnating and sealing them with Waterlox Transparent.

Save time, labor, and material! The use of Waterlox means a savings all around.

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THE EMPIRE VARNISH COMPANY
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HELPFUL LITERATURE

NOTE TO READERS: If you will check the item or items described which particularly interest you, we will be glad to request the manufacturers concerned to send you their literature. Use the attached postal card.

1. Diecasting Machines

Miller-Taylor Tool Co.—22-page illustrated booklet presents details of complete line of diecasting machines for producing small, medium, heavy and outsize castings. Specifications are given on plunger gooseneck machines for zinc, lead and tin; and on cold chamber type machines for aluminum, brass and magnesium.

2. Lift Trucks

Barrett-Cravens Co.—28-page illustrated bulletin No. 4883 describes improved line of hand lift trucks with capacities from 1000 to 15,000 pounds. Data to aid in selection of proper model for specific applications are included.

3. Core Blower Plastics

Eastern Clay Products Inc. — 8-page illustrated booklet "Dura Wear-Resisting Plastics" gives information on several plastic products to be used in core blower operation. Duratube resilient plastic blow tube for blowing cores pinches off sand flush with cores and gives extraordinary long life, Durabutton wear insert for core boxes can be changed quickly, and Durastrip is plastic sheet from which wear strips for core boxes or wear inserts can be cut.

4. Grinding & Polishing

Armour & Co.—4-page illustrated folder entitled "Facts about Backstand Belt Grinding and Polishing" presents information relative to advantages of using this method for grinding welds, removing flash, generating radii and for flat and edge work.

5. Fume Collectors

Ruemelin Mfg. Co.—4-page illustrated bulletin No. 37-D discusses welding fume collectors which draw fumes and heat away at their source by use of high velocity exhaust hoods, with fan exhausting outdoors.

6. Motorized Hand Trucks

Moto-Truc Co.—8-page illustrated bulletin No. 49 presents data on motorized 'walkie' type platform, pallet, telescopic high-lift, high-lift, counterbalance lift, and tractor type trucks.

7. Foundry Flasks

Black, Sivalls & Bryson, Inc.—Illustrated book "BS&B Foundry Flask Catalog & Price List" contains sections giving general information on basic construction of flasks and telling how to order them with specifications and estimate sheet which is included, giving descriptions and uses of all styles of BS&B flasks along with drawings and photographs, and covering flask parts and accessories.

8. Lithium Cartridges

Metalloy Corp.—4-page pamphlet "Lithium for the Treatment of High Conductivity Copper and Copper-base Alloys" discusses cause of porosity in castings and use of lithium as deoxidizer in high conductivity copper castings, copper-base alloys, nickel silver, silicon bronze and similar alloys.

9. Wood Planer

Buss Machine Works—6-page illustrated bulletin No. 56 deals with No. 208 single surface, four-roll wood planer having capacity for stock up to 8 inches thick and 20 inches wide. This small machine is suitable for use in pattern shops, mills and lumber yards and as auxiliary planer for large woodworking plants.

10. Portable Elevator

American Hoist & Derrick Co.—8-page illustrated catalog No. 200-D-6A depicts various uses to which portable material elevator can be put in construction work. Unit can be converted to bucket elevator to aid in speedy materials handling.

11. Portable Electric Saws

Chicago Pneumatic Tool Co.—6-page illustrated bulletin No. 3000 presents data on three Hi-Speed portable electric circular saws which have capacities of 2-7/16, 2-13/16 and 3¼ inches. Blades are shown for cutting through metals, tile, glass, brick, clay products, marble, asbestos and other materials in addition to wood.

12. Sand Conditioning

Beardsley & Piper—8-page illustrated bulletin No. 1130 depicts methods for complete sand conditioning and lists specifications of equipment available. Listed also are various pieces of accessory equipment.

13. Plastic Patterns

Plastic Corp. of Chicago—4-page illustrated mailing piece entitled "Plastic Patterns Are a Practical Reality" enumerates advantages of plastic patterns which include ability to duplicate broken aluminum patterns, master patterns, cope and drag sections or core boxes of wood, metal or any other material.

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14. Mounted Wheels & Points

Simonds Abrasive Co.—8-page illustrated folder form ESA-67 describes versatility of mounted wheels and points for offhand and precision work for grinding in hard-to-reach places. Information on grains, grades, operating speeds and ordering procedure is given.

15. Fork Lift Trucks

Clark Equipment Co.—32-page illustrated booklet "Looking at Clark from all Angles" discusses what a fork lift truck is designed to do, comparative turning radius of solid-tired and pneumatic-tired machines, principles of counterweighting, how turning radius affects maneuverability and other basic factors relating to fork lift trucks.

16. Hydrostatic Precipitator

American Air Filter Co.—20 page illustrated bulletin No. 277A explains operation of type N Roto-Clone hydrostatic precipitator for dust control. Listed are various arrangements to meet specific requirements, capacity data and general air engineering information.

17. Grinding & Finishing

Minnesota Mining & Mfg. Co.—16-page illustrated booklet A-SUPB discusses development of backstand method of abrasive belt grinding and finishing and how it helps to step up production. Lathes, backstand idlers, abrasive belts, contact wheels and engineering service are discussed also.

18. Centrifugal Blast Cleaner

American Wheelabrator & Equipment Corp.—24-page illustrated catalog No. 74-A explains Wheelabrator airless blast cleaning unit in which abrasive from overhead storage hopper is fed to center of wheel whereupon it is hurled under perfect control upon work to be blasted.

19. Face Shield

Mine Safety Appliances Co.—Illustrated leaflet No. CN-2 contains information on noninflammable vinyl plastic DeLuxe face shield which provides face protection with unobstructed vision to workers handling acids and chemicals, pouring metal, sanding, grinding, degreasing and performing similar operations.

20. Silica Cement

Chas. Taylor Sons Co.—6-page illustrated publication No. 507 gives complete description of properties of Tayco-40 high temperature silica cement and its application for bonding silica and super-duty silica refractories used in construction of glass melting, open-hearth and electric arc melting furnaces.

21. Rubber Foundry Compounds

Foundry Rubber Inc.—4-page folder "Para Products" outlines features of Paraspray core and mold surface conditioner, chill coating and kick preventer; Paracoat pattern, corebox and model coating; and Bonispray dressing for permanent molds, diecastings and centrifugal castings.

22. Abrasive Belt Machines

Standard Electrical Tool Co.—Illustrated bulletin No. 70 covers complete line of abrasive belt machinery and includes bench and floor models with horizontal backstands, flexible horizontal-vertical backstands and individual wheel heads. Listed also are various sizes of spring loaded and air cylinder backstands using from 6 to 20-inch diameter contact wheels and belt speeds as high as 9500 surface feet per minute.

23. Metal Blast Cleaners

Alloy Metal Abrasive Co.—Three illustrated bulletins Nos. 110, 115 and 125 present information on Cleanblast Alloy 99 blasting shot, Superblast metal blast cleaning material, and Cleanblast Amasteel alloy steel shot, respectively.

24. Motorized Wheelbarrow

Kwik-Mix Co.—2-page illustrated specification sheet presents details of small gasoline engine-driven wheelbarrow which handles up to 12 cubic feet of material at speeds of 2 to 4 miles per hour. Features include automatic load dumping, pneumatic tires and double-acting clutch.

25. Grinding Wheel Dressers

Desmond-Stephan Mfg. Co.—Illustrated 9 x 12-inch wall chart shows various types of dressers for different applications on several types and sizes of grinding wheels and gives model and size numbers of dressers to serve particular wheel diameters and faces.

26. Flexible Shafting

Stow Mfg. Co.—Ten illustrated bulletins bound between covers list various standard and heavy-duty flexible shaft machines, shafts and accessories which can be obtained for specific job requirements. Listed also are special heads and prices for various units.

27. Castable Refractory

Walsh Refractories Corp.—Bulletin presents complete information on H & B castable 'mix-and-pour' refractory which is suitable for variety of applications.

28. Tungsten Steel

Molybdenum Corp.—92-page illustrated book entitled "Tungsten Steel" discusses tungsten in steel from standpoint of production, principal uses and data on results.

29. Plastic Firebrick

Mexico Refractories Co.—4-page illustrated folder entitled "Helspot, the Super Quality Plastic Firebrick" depicts advantages of this material for lining ladles and metallurgical furnaces.

30. Portable Belt Conveyors

Barber-Greene Co.—8-page illustrated bulletin No. 363 deals with all-purpose portable belt conveyors which are made in lengths of 25, 30 and 35 feet and with plain or cleated belts for handling all types of materials and packaged items.

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and all types of nails

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that last and last and last!

Air-O-chek The Valve with the internal fulcrum lever

An invention in valve means

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Used in leading foundries and machine shops.

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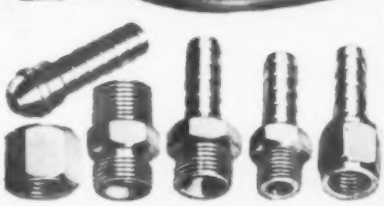

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CORE BOX VENTS

Here's part of a complete line of DEMMLER core box vents—rigidly constructed in varying sizes of slotted brass—slotted steel—and screen mesh. Orders filled promptly from stock.

BRASS SLOTTED CORE BOX VENTS
Slot widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

STEEL SLOTTED CORE BOX VENTS
Slot widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

SCREEN TYPE CORE BOX VENTS
Mesh: #30, #40, #50.
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

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A NEW WADSWORTH CORE EXTRUDER

• DIRECT DRIVE
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S F S Eliminates Costly Repairs!*

• GEARS • TOTALLY ENCLOSED RUN IN OIL BATH

* *SEALED FROM SAND!*

• BEARINGS • DOUBLE SEALED FOR LIFE • BALL

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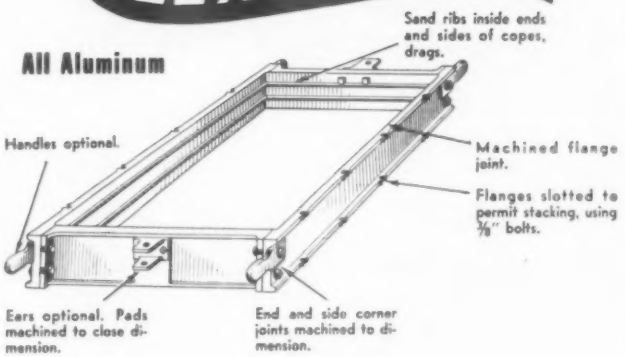
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1938— AFA questionnaire revealed that 8% of steel casting men used radium radiography.

1941— 22% of steel casting men bought, rented, leased or employed radium for radiographic purposes.

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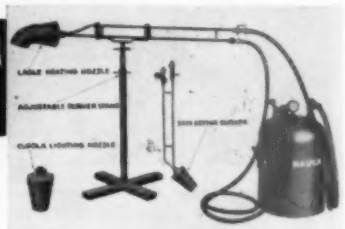

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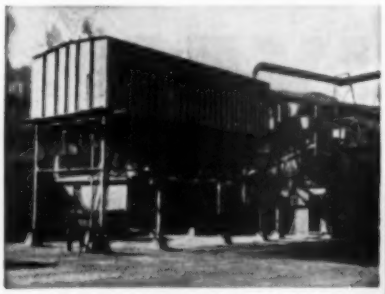

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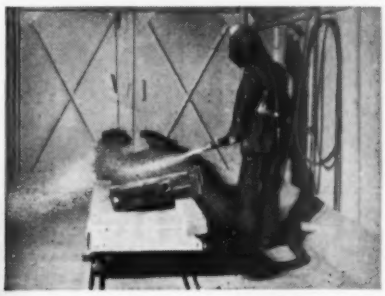

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Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

CORE VENTS

Demmler, Wm., & Bros., Kewanee, Ill.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, Ohio.
Foundry Service Co., Birmingham, Ala.
Smillie, C. M. & Co., 1100 Woodward Heights Blvd., Ferndale, Mich.
United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

CORE WASH

Bloomsbury Graphite Co., Bloomsbury, N. J.
Carborundum Co., Perth Amboy, N. J.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Corn Products Sales Co., 17 Battery Pl., New York City 4.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co. 4600 E. 71st St., Cleveland 5, O.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Stevens Frederic B., Inc., Detroit 26, Mich.
Superior Flake Graphite Co., 33 S. Clark St., Chicago 3, Ill.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
United States Graphite Co., Saginaw, Mich.

CORE WIRE CUTTERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE WIRE STRAIGHTENERS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORES (Annealing)

Pressed Steel Co., Wilkes-Barre, Pa.

COUPLINGS (Air Line)

Cleco Division of Reed Roller Bit Co., Houston, Texas.
C. B. Hunt & Sons Inc., Salem, Ohio
U. S. Air Compressor Co., 5300 Harvard Ave., Cleveland 5, Ohio.

COUPLINGS (Flexible)

Ajax Flexible Coupling Co., Westfield, N. Y.

CRANE LUBRICATING SYSTEMS

Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa.

CRANES (Bucket)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Electric Tramrail)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Robbins & Myers, Inc., Springfield, Ohio.

CRANES (Electric Traveling)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div., of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Erie Steel Construction Co., Erie, Pa.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Northern Engineering Works, 2615 Atwater, Detroit 7, Mich.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Gantry)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
2615 Atwater, Detroit 7, Mich.
Northern Engineering Works,
Wellman Engineering Co., 7000 Central Ave., Cleveland 4, O.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Hand Traveling)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Northern Engineering Works, 2615 Atwater, Detroit 7, Mich.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Robbins & Myers, Inc. Springfield, Ohio.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Jib)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Monorail)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.

CRANES (Monorail) (Cont'd.)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Northern Engineering Works, 2615 Atwater, Detroit 7, Mich.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.

CRANES (Self-Propelled)

Hughes-Keenan Co., Mansfield, Ohio
Orton Crane & Shovel Co., 606 So. Dearborn, Chicago, Ill.
Silent Hoist & Crane Co., 885 63rd St., Brooklyn 20, N. Y.

CRANES (Traction or Tractor)

Silent Hoist & Crane Co., 885 63rd St., Brooklyn 20, N. Y.

CRUCIBLES

American Crucible Co., North Haven, Conn.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co., Pittsburgh, Pa.
National Crucible Co. Mermaid Lane and Queen Sts., Philadelphia 18, Pa.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Vesuvius Crucible Co., Swissvale, Pa.

CRUCIBLE FURNACES

Ajax Electrothermic Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

CRUCIBLE LIFTERS

Modern Equipment Co., Port Washington, Wis.

CRUCIBLE POURING DEVICES

Modern Equipment Co., Port Washington, Wis.

CRUSHERS (Core)

Simplicity Engineering Co., Durand, Mich.

CUPOLAS

Modern Equipment Co., Port Washington, Wis.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Roots-Connersville Blower Corp., Connersville, Ind.
Spencer Turbine Co., Hartford, Conn.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CHARGING MACHINES

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CONTROL EQUIPMENT

Foxboro Company, Foxboro, Mass.

CUPOLA DUST ARRESTORS

Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.

CUPOLA LININGS

Carborundum Co., Perth Amboy, N. J.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.
A. P. Green Fire Brick Co., Mexico, Missouri
Ironton Fire Brick Co., Ironton, O.
Robinson Clay Product Co., 1100 Second National Bldg., Akron, Ohio.
United States Graphite Co., Saginaw, Mich.

CUPOLA PRESSURE VALVES

Norwalk Valve Co., S. Norwalk, Conn.

CUPOLA SPARK ARRESTORS

Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUTOFF MACHINES (Abrasive)

Fox Grinders Inc., Oliver Bldg., Pittsburgh, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

DARK ROOM ACCESSORIES (X-Ray)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

DARK ROOM PROCESSING (Chemical Tanks, etc.)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

DEGASIFIERS

Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Metalloy Corp., Rand Tower, Minneapolis 2, Minn.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

DENSIFIED WOOD

Parkwood Corp., Wakefield, Mass.

DEOXIDIZERS

Alter Company, 1702 Rockingham Rd., Davenport, Iowa.
Ajax Metal Co., 46 Richmond St., Philadelphia 23, Pa.
Federated Metals Div.
American Smelting and Refining Co., 120 Broadway, New York 5.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Metalloy Corp., Rand Tower, Minneapolis 2, Minn.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

DEOXIDIZERS (Ferrous)

Carborundum Co., Perth Amboy, N. J.

DESULPHURIZERS

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.
Modern Equipment Co., Port Washington, Wis.

DESULPHURIZERS (Cont'd.)

Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DIE CASTING MACHINES

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, O.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio.
Kux Machine Co., 3930 W. Harrison St., Chicago 24, Ill.
Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio.
Miller-Taylor Tool Co., 5005 Euclid Ave., Cleveland 3, Ohio

DIES

City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio

DIRECT FIRED HEATERS

Dravo Corp., Neville Island, Pittsburgh 25, Pa.
Surface Combustion Corp., Toledo 7, Ohio.

DOWEL PINS

Standard Horse Nail Corp., New Brighton, Pa.

DRILLS (Pneumatic)

Gardner-Denver Co., Quincy, Ill.
Schramm Inc., West Chester, Pa.

DRIVES (Reciprocating)

Ajax Flexible Coupling Co., Westfield, N. Y.

DRUMS (Magnetic)

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 662 S 28th St., Milwaukee 4, Wis.

DUMP HOPPERS

Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

DUMP TRUCKS

Bell Aircraft Corp., Niagara Falls, N. Y.
Tractomotive Corp., Deerfield, Ill.

DUST ARRESTING EQUIPMENT

American Air Filter Co., Inc., 266 Central Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Schneible Co., Claude B., 2827-25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DUST COLLECTORS

Pangborn Corp., Hagerstown, Md.
Schmeig Industries, 6560 Cass Ave., Detroit 2, Mich.
Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.

DUST COLLECTOR (Shake-out)

Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.

DUST CONTROL (Chemical)

Johnson March Corp., 1724 Chestnut St., Philadelphia, Pa.
Pangborn Corp., Hagerstown, Md.

DUST RECOVERY SYSTEMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.

ELECTRIC FURNACES (see Furnaces, Electric)

ELECTRODES (Graphite and Amorphous)

International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co., Inc., Electrode Sales Div., 30 E. 42nd St., New York 17, N. Y.

ELEVATORS

Standard Conveyor Co., North St. Paul 9, Minn.

ELEVATORS (Bucket)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Chain Belt Co., 1671 W. Bruce St., Milwaukee 4, Wis.
Jeffrey Mfg. Co., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

ELEVATORS (Material Handling)

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

ELEVATORS (Pneumatic, Material Handling)

Fuller Co., Catasauqua, Pa.

ENGINEERING SERVICE (Foundry)

Frank D. Campbell, 332 So. Michigan Ave., Chicago, Ill.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
A. H. Putnam Co., 1319 2nd Ave., Rock Island, Ill.
Westover Engineers, 424 E. Wells St., Milwaukee 2, Wis.
Wickland Co., A. A., 205 W. Wacker Dr., Chicago 6, Ill.

ENGINEERING SERVICE (Permanent Mold)

Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

EXHAUST SYSTEMS

American Air Filter Co., Inc., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Propellair Inc., Springfield, O.
Schmeig Industries, 6560 Cass Ave., Detroit 2, Mich.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.

FABRICATORS (Metal)

Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

FACINGS

Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Stevens Inc., Frederic B., Detroit 16, Mich.
Superior Flake Graphite Co., 33 S. Clark St., Chicago 3, Ill.
United States Graphite Co., Saginaw, Mich.

FANS (Ventilating, Exhaust, Cooling, etc.)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Joy Mfg. Co., La Del Division, New Philadelphia, Ohio.
Pangborn Corp., Hagerstown, Md.
Propellair Inc., Springfield, O.

FEEDERS (Rotary)

Fuller Company, Catasauqua, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Newaygo Engineering Co., Newaygo, Mich.

FEEDERS (Sand)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

FERROBORON

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROCHROME

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Hickman-Williams & Co., Cleveland, O.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROCOLUMBIUM

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

FERROMANGANESE

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 2, O.
Tennessee Products & Chemical Corp., American National Bank Bldg., Nashville 3, Tenn.

FERROMOLYBDENUM

Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.
Molybdenum Corporation of America, Pittsburgh 19, Pa.

FERROPHOSPHOROUS

Tennessee Products & Chemical Corp., American National Bank Bldg., Nashville 3, Tenn.

FERROSILICON

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Globe Iron Co. Jackson, Ohio

FERROSILICON (cont'd.)

Jackson Iron & Steel Co., Jackson, O.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Ohio Ferro-Alloys Corp., Canton 2, O.
Tennessee Products & Chemical Corp., American National Bank Bldg., Nashville 3, Tenn.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTITANIUM

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTUNGSTEN

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROVANADIUM

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FILM (X-Ray)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

FILTERS (Air)

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

FIRE BRICK

Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.
Carborundum Co., Perth Amboy, N. J.
A. P. Green Fire Brick Co., Mexico, Missouri
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Norton Co., Worcester 6, Mass.
Robinson Clay Product Co., 1100 Second National Bldg., Akron, Ohio.
Stevens Inc., Frederic B., Detroit 16, Mich
Chas. Taylor Sons Co., P. O. Box 58, Annex Sta., Cincinnati 14, Ohio.

FIRE CLAY

Eastern Clay Products, Inc., Jackson, O.
A. P. Green Fire Brick Co., Mexico, Missouri
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Robinson Clay Product Co., 1100 Second National Bldg., Akron, Ohio.
Chas. Taylor Sons Co., P. O. Box 58, Annex Sta., Cincinnati 14, Ohio.

FIRE SAND

Carborundum Co., Niagara Falls, N. Y.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FIRESTONE

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FITTINGS (Air Line)

U. S. Air Compressor Co., 5300 Harvard Ave., Cleveland 5, Ohio

FLASK BANDS

Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

FLASK BUSHINGS

Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Universal Engineering Co., Frankenmuth, Mich.

FLASK PINS

Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
General Foundry Service Corp., 516 23rd Ave., Oakland 6, Calif.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Universal Engineering Co., Frankenmuth, Mich.

FLASKS (Adjustable)

C. S. Humphrey Co., 249 2nd St., Moline, Ill.

FLASKS (Aluminum)

Adams Co., Dubuque, Iowa.
Foundry Service Co., Birmingham, Ala.
Fremont Flask Co., Fremont, O.
General Foundry Service Corp., 516 23rd Ave., Oakland 6, Calif.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASKS (Dowmetal)

Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASK FILLERS

Bartlett & Snow, C. C., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Jeffrey Mfg. Co., Columbus 16, O.

FLASKS (Slip)

Adams Co., Dubuque, Iowa.
Fremont Flask Co., Fremont, O.
Freeman Supply Co., Toledo 5, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

FLASKS (Snap)

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div. Rockwell Mfg. Co., Freeport, Ill.
Fremont Flask Co., Fremont, O.
General Foundry Service Corp., 516 23rd Ave., Oakland 6, Calif.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Stevens, Inc., Frederic B., Detroit 16, Mich.

FLASKS (Steel)

Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
Foundry Service Co., Birmingham, Ala.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Shanafelt Mfg. Co., 2623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

FLASK FITTINGS

Adams Co., Dubuque, Iowa.
Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
General Foundry Service Corp., 516 23rd Ave., Oakland 6, Calif.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

FLASK LIFT MACHINES

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39 Ill
The Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

FLASK LUMBER

Dougherty Lumber Co., 4300 E. 66th St., Cleveland 5, O.
Rietz Lumber Co., 1800 N. Central Park Ave., Chicago, Ill.

FLASKS (Wood)

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.

FLEXIBLE SHAFT MACHINERY

Stow Mfg. Co., Binghamton, N. Y.

FLOORING (Non-Slip)

Norton Co., Worcester 6, Mass.

FLUXES

American-British Chemical Supplies Inc., 180 Madison Ave., New York 16, N. Y.
Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.
National Pigment Co., East York St., Philadelphia, Pa.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Puro-Seal Co., 414 Swetland Bldg., Cleveland 13, Ohio
Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.

FLUXES (Soldering, Welding & Tinning)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

FOUNDRY CONSULTANTS

A. A. Wickland Co., 205 W. Wacker Dr., Chicago 6, Ill.

FOUNDRY ENGINEERS

A. A. Wickland Co., 205 W. Wacker Dr., Chicago 6, Ill.

FOUNDRY LAYOUT & METHODS

Frank D. Campbell, 332 So. Michigan Ave., Chicago, Ill.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
A. A. Wickland Co., 205 W. Wacker Dr., Chicago 6, Ill.

FOUNDRY NAILS

Standard Horse Nail Corp., New Brighton, Pa.

FOUNDRY SHOVELS
(See SHOVELS)

FOUNDRY SUPPLIES

Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.

FOUNDRY SUPPLY HOUSES

Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Eastern Clay Products, Inc., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Service Co., Birmingham, Ala.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, O.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Stevens, Inc., Frederic B., Detroit 16, Mich.

FURNACES (Aluminum & Magnesium Billets)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Foundry Equipment Co., 1831 Columbus Rd, Cleveland 13, Ohio.

FURNACES (Aluminum & Magnesium Forgings)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

FURNACES (Aluminum Melting)

Ajax Engineering Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Surface Combustion Corp., Toledo 7, Ohio.

FURNACES (Aluminum Rivet Heating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.

FURNACES (Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lindberg Engineering Co., Fisher Furnace Div. 2450 West Hubbard, Chicago 12, Ill.

FURNACES (Crucible Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave, Franklin Park, Ill.

FURNACES (Electric Melting)

Ajax Electric Furnace Corp., 46 Richmond St., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton N. J.
Ajax Metal Co., Philadelphia 23, Pa.

FURNACES (Electric Melting) (Cont'd.)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Gas or Oil Fired)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., Fisher Furnace Div. 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

FURNACES (Gray Iron Melting)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.

FURNACES (Heat Treating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

FURNACES, HEAT TREATING (Electric)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

FURNACES (Induction Heating)

Allis Chalmers Mfg. Co., Milwaukee 1, Wis.

FURNACES (Malleable Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lindberg Engineering Co., Fisher Furnace Div. 2450 West Hubbard, Chicago 12, Ill.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Malleable Melting)

American Bridge Co., Pittsburgh 19, Pa.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.

FURNACE (Malleable Melting) (cont'd.)

Surface Combustion Corp. Toledo, 7, Ohio
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Nonferrous Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., Harrison, O.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
Swindell-Dressler Corp., Pittsburgh, Pa.

FURNACES (Powdered Coal)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Steel Melting)

Ajax Electrothermic Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.

FURNACE BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.

FURNACE LININGS

Campbell-Hausfeld Co., Harrison, O.
Carborundum Co., Perth Amboy, N. J.
A. P. Green Fire Brick Co., Mexico, Missouri
Ironton Fire Brick Co., Ironton, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
United States Graphite Co., Saginaw, Mich.

GAGES

Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

GAGGERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Wadsworth Equipment Co. 2457 Mogadore Rd., Akron, Ohio

GAS (Oxygen, Acetylene, Industrial)

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

GAS BURNERS

Fisher Furnace Co., 2543 West Hubbard St., Chicago 12, Ill.

GENERATORS (Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

GLOVES (Industrial, Safety)

American Optical Co., Southbridge, Mass.
Edmont Mfg. Co., Coshocton, Ohio.
C. Walker Jones Co., 6135 Lambert St., Philadelphia 38, Pa.
Richmond Glove Corp., Richmond, Ind.

GOGGLES and EYE PROTECTORS

American Optical Co., Southbridge, Mass.
Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Willson Products Inc., Reading, Pa.

GRAPHITE

Acheson Colloids Corp., Port Huron, Mich.
Bloomsbury Graphite Co., Bloomsbury, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Service Co., Birmingham, Ala.
International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17.
Superior Flake Graphite Co., 33 S. Clark St., Chicago 3, Ill.
United States Graphite Co., Saginaw, Mich.

GRINDERS (Electric Portable)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Independent Pneumatic Tool Co., Aurora, Ill.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.
U. S. Electrical Tool Co., Cincinnati 4, O.

GRINDERS (Flexible Shaft)

Stow Mfg. Co., Binghamton, N. Y.

GRINDERS (Pneumatic Portable)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Independent Pneumatic Tool Co., Aurora, Ill.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

GRINDERS (Surface, Bench, Disc, Floor)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Independent Pneumatic Tool Co., Aurora, Ill.
Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.
Standard Electrical Tool Co., 2488 Riverside Ave., Cincinnati 4, Ohio.
U. S. Electrical Tool Co., Cincinnati 4, O.
Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis 2, Ind.

GRINDERS (Swing Frame)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.

GRINDERS (Swing Frame) (Cont'd.)

Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis 2, Ind.

GRINDING WHEELS—See ABRASIVE WHEELS

GRINDING WHEEL DRESSERS

Carborundum Co., Niagara Falls, N. Y.
Desmond-Stephan Mfg. Co., Urbana, O.

GRINDSTONES

Bay State Abrasive Products Co., Westboro, Mass.
Sterling Grinding Wheel Div., Cleveland Quarries Co., 1740 E. 12th St., Cleveland, O.

GRIT (Abrasive)

Alloy Metal Abrasive Co., Ann Arbor, Mich.
American Steel Abrasives Co., Galion, O.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carborundum Co., Niagara Falls, N. Y.
Clayton Sherman Abrasives Co., 3896 Lonyo Rd., Detroit 10, Mich.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Globe Steel Abrasive Co., Mansfield, O.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

HAMMERS (Chipping)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, Ohio.
Independent Pneumatic Tool Co., Aurora, Ill.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Schramm Inc., West Chester, Pa.

HARDNESS TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4 Mich
Steel City Testing Machines Inc., 8843 Livernois Ave., Detroit 4, Mich.

HEAT CONTROL AND RECORDING DEVICES

Brown Instrument Co. Div. Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia 44, Pa.
Foxboro Company, Foxboro, Mass.
Lindberg Engineering Co., Fisher Furnace Div. 2450 West Hubbard, Chicago 12, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

HEATERS (Gas, Oil, Electric)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

HEATERS (Gas, Oil, Electric)

Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.
Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N.Y.

HEATERS (High Frequency Electric)

Ajax Electrothermic Corp., Trenton, N. J.

HEATERS (Indirect Fired)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

HEATERS (Space, Unit, Direct Fired)

Dravo Corp., Neville Island, Pittsburgh 25, Pa.
Surface Combustion Corp., Toledo 7, Ohio.

HEATERS (Space, Unit, Oven, Water)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Surface Combustion Corp., Toledo 7, Ohio.

HELMETS (Blasting)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Optical Co., Southbridge, Mass.
Mine Safety Appliance Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, O.

HELMETS (Welding)

American Optical Co., Southbridge, Mass.

HOISTS (Air)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis 20, Mo.
Gardner-Denver Co., Quincy, Ill.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.

HOISTS (Chain)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
David Round & Sons, Broadway & Henry Sts., Cleveland 5, Ohio

HOISTS (Electric)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
David Round & Sons, Broadway & Henry Sts., Cleveland 5, Ohio
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Modern Equipment Co., Port Washington, Wis.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOIST (Electric) (Cont'd.)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

HOISTS (Hand)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
David Round & Sons, Broadway & Henry Sts., Cleveland 5, Ohio

HOPPERS (Sand)

Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

HOSE (Air, Blasting, Water, Gas)

Gardner-Denver Co., Quincy, Ill.
Hewitt Rubber Div. Hewitt-Robins Div., Inc., 240 Kinsington Ave., Buffalo 5, N. Y.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Pangborn Corp., Hagerstown, Md.
Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J.
Schramm Inc., West Chester, Pa.

HYDRAULIC CLEANING EQUIPMENT

Hydro-Blast Corp., 2050 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
N. Ransohoff, Inc., 16 E. 72nd St., Cincinnati 16, Ohio.

HYDRO FINISHING EQUIPMENT

Pangborn Corp., Hagerstown, Md.

ILLUMINATORS (X-Ray Film)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

IMPREGNATING SYSTEMS

Empire Varnish Co., 2636 E. 76th St., Cleveland 4, O.

INDUSTRIAL ENGINEERING SERVICE

Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
Westover Engineers, 424 E. Wells St., Milwaukee 2, Wis.

INGOT MOLDS

Acme Foundry Co., Detroit 16, Mich.

INGOTS (Nonferrous)

Ajax Metal Co., Philadelphia 23, Pa.
American Smelting and Refining Co., 120 Broadway, New York 5.
Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.
Cleveland Electro Metals Co., W. 38th St. & NP R.R. Cleveland 13, O.
Federated Metals Div., American Smelting and Ref. Co., New York 5.
International Nickel Co., Inc., 67 Wall St., New York City 5.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Northwestern Iron & Metal Co., 3235 S. 30th St., Lincoln, Nebraska
Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.
Sonken-Galamba Corp., Kansas City 18, Kansas.
Western Metals Co., 3201 So. Kedzie Ave., Chicago 23, Ill.

INJECTION MOLDING MACHINES

Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio.
W. McGeough, Milwaukee 7, Wis.

INOCULANTS

Carborundum Co., Perth Amboy, N. J.

IRON CEMENT

Smooth-On Mfg. Co., 570 Communipaw Ave., Jersey City 4, N. J.

IRON ORE

Pickands, Mather & Co., Cleveland 14, O.

IRON OXIDES

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Delta Oil Products Co., Milwaukee 9, Wis.

JACKETS (Mold)

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

LABORATORY EQUIPMENT (Chemical)

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.
Laboratory Equipment Corp., St. Joseph, Mich.
National Spectrographic Laboratories Inc., 6300 Euclid Ave., Cleveland, Ohio.

LABORATORY EQUIPMENT (Physical)

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.
Laboratory Equipment Corp., St. Joseph, Mich.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Norton Co., Worcester 6, Mass.

LADLES

Foundry Service Co., Birmingham, Ala.
Industrial Equipment Co., Minster, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Modern Equipment Co., Port Washington, Wis.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

LADLE LININGS

A. P. Green Fire Brick Co., Mexico, Missouri
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Ironton Fire Brick Co., Ironton, Ohio.

LATHE CENTERS

Chicago Mfg. & Distributig Co., 1928 W. 46th St., Chicago 9, Ill.

LEAD

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.

LINSEED OIL

Hercules Powder Co., Wilmington 99, Del.

LOADERS

Clearfield Machine Co., Clearfield, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

LUBRICANTS (Industrial)

Acheson Colloids Corp., Port Huron, Mich.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill. New York 26, N. Y.
United States Graphite Co., Saginaw, Mich.

LUMBER (All kinds)

Dougherty Lumber Co., 4300 East 68th St., Cleveland 5, O.

MACHINE KEYS

Standard Horse Nail Corp., New Brighton, Pa.

MACHINERY MOUNTING PADS

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

MAGNESIUM (Ingots)

Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.

MAGNET CONTROLLERS

Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, Ohio.

MAGNETS

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, Ohio.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

MANGANESE (Briquets)

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

MATCHPLATES

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.
Central Pattern Co. Quincy, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.
Plaster Process Castings Co., 6922 Carnegie Ave., Cleveland 3, O.
Scientific Cast Products Corp., 1388-92 E. 40th St., Cleveland 3, O.

MATERIALS HANDLING

Hughes-Keenan Co., Mansfield, Ohio.
Orton Crane & Shovel Co., 608 So. Dearborn, Chicago, Ill.

MATERIALS HANDLING DESIGN

Frank D. Campbell, 332 So. Michigan Ave., Chicago, Ill.

MATERIALS HANDLING (Hoists)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.

MECHANICAL ENGINEERS

Frank D. Campbell, 332 So. Michigan Ave., Chicago, Ill.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

MELTING POTS

Acme Foundry Co., Detroit 16, Mich.

METAL CASTING PLASTER

United States Gypsum Co., 300 W. Adams St., Chicago, Ill.

METAL CLEANING EQUIPMENT

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
N. Ransohoff, Inc., 16 E. 72nd St., Cincinnati 16, Ohio.

METALLOGRAPHIC EQUIPMENT

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

METALLURGISTS

Crobaugh Co., Frank L., 1426 West Third St., Cleveland 13, Ohio.

METERS (Gas, Air, Water)

Roots-Connersville Blower Corp., Connersville, Ind.

MIXERS (Core Wash)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

MIXERS (Sand and Clay)

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Blystone Division, Standard Sand & Machine Co., 549 W. Washington St., Chicago 6, Ill.
Clearfield Machine Co., Clearfield, Pa.
Construction Machinery Co., Waterloo, Iowa.
Fordath Engineering Co. Ltd., West Bromwich, Birmingham, England.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Royer Foundry & Machine Co., Kingston, Pa.
Sather Mfg. Co., Everett, Wash.

MODELS (Wood)

Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

MOLD BOARDS

Parkwood Corp., Wakefield, Mass.

MOLD CONVEYORS

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Chain Belt Co., 1671 W. Bruce St., Milwaukee 4, Wis.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

MOLD CONVEYORS (Cont'd.)

Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.

MOLD DRYERS

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

MOLD OVENS and DRYERS

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, O.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.
Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N. Y.

MOLD TRUCKS (Power Operated)

Clark Industrial Truck Div. of Clark Equipment Co., Battle Creek, Mich.

MOLD WASH

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Superior Flake Graphite Co. 33 So. Clark St., Chicago 3, Ill.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
United States Graphite Co., Saginaw Mich.

MOLDERS BENCHES

Western Tool & Mfg. Co., Springfield, Ohio

MOLDING MACHINES

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div., Rockwell Mfg. Co., Freeport, Ill.
Beardsley & Piper Co., The, 2424 N. Cicero, Chicago 39, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Foundry Service Co., Birmingham, Ala.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Moline Iron Works, Moline, Ill.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING MACHINES (Jolt)

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div., Rockwell Mfg. Co., Freeport, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
The Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING MACHINE MOUNTING PADS

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

MOLDING MACHINE (Repairing)

Standard Pattern Works, 13781 Concord, Detroit 12, Mich.

MOLDING MACHINES (Rollover)

Arcade Manufacturing Div., Rockwell Mfg. Co., Freeport, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Co., 867 Addison Rd:, Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
The Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING MACHINES (Squeeze)

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div., Rockwell Mfg. Co., Freeport, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Moline Iron Works, Moline, Ill.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
The Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING SANDS

Great Lakes Foundry Sand Co., United Artists Bldg., Detroit 26, Mich.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

MOLYBDENUM

Molybdenum Corporation of America, Pittsburgh 19, Pa.

MONORAIL SYSTEMS

American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
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American Air Filter Co., Louisville 8, Ky.
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New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.
Productive Equipment Co., 2926 W. Lake St., Chicago 12, Ill.
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Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
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American Wheelabrator & Equipment Co. Mishawaka, Ind.
American Steel Abrasive Co., Galion, O.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Globe Steel Abrasive Co., Mansfield, Ohio.
Metal Blast, Inc. 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co. 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
Steel Shot & Grit Co., Inc. 39 Warren Ave., Boston, Mass.

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Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
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American Smelting and Refining Co., 120 Broadway, New York 5.
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Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.

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Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
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Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
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We would be interested in having an experienced man that is capable of getting along with men and can reduce scrap to a minimum—to act as Molding Foreman in a production foundry running 25 squeezer floors. State past history and salary expected in first letter. Address: Box 526, The FOUNDRY, Cleveland 13, Ohio.

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Experienced man with good educational background and technical training in malleable practice. Must be thoroughly qualified to rig jobs properly, both jobbing and production and to produce quality castings at low cost with low scrap. Good chance for advancement with progressive Middlewest company. Salary plus performance bonus. State experience, personal data and salary expected in first letter. Address: Box 543, The FOUNDRY, Cleveland 13, Ohio.

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With experience in melting cast iron, electric furnace and cupola. Production foundry in Mississippi Valley. State salary expected. Salesman with experience selling production gray iron castings 1 to 1000 lbs. preferred. Address: Box 544, The FOUNDRY, Cleveland 13, Ohio.

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Small brass and aluminum foundry, located in New York state. Must be able to produce first class castings at a reasonable cost—know mixtures to produce best results and able to cooperate with others in our organization. Prefer man who has had jobbing experience—married—35 to 45 years of age and who can get results. Address: Box 527, The FOUNDRY, Cleveland 13, Ohio.

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Thirty years' experience making all kinds of steel for castings or ingots, basic or acid. Familiar with construction and operation of furnaces. Can furnish very best of references. Address: Box 354, The FOUNDRY, Cleveland 13, Ohio.

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Manager of industrial relations. Thoroughly familiar with all production processes in manufacture of carbon, medium and high alloy castings. Have successfully supervised purchasing, stores, production control, production engineering, plant engineering, metallurgy, inspection, time study and incentive plans, cost estimating, cost accounting, labor relations and contract negotiations with unions. University graduate. Address: Box 534, The FOUNDRY, Cleveland 13, Ohio.

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Twenty-two years of managerial and practical experience in all phases of grey iron foundry management including plant operations, sales, labor relations and personnel work. Excellent references. Age 46. Address: Box 532, The FOUNDRY, Cleveland 13, Ohio.

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Experienced grey iron jobbing production, soil pipe and fittings, steam and drainage. McClain graduate mixing and melting. Produce machinable iron without pig. Well versed all operations. Desire position Eastern states. Address: Box 503, The FOUNDRY, Cleveland 13, Ohio.

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Twenty-two years' practical experience on gray iron and aluminum. Five years as foreman, can take full charge of small or medium shop. May consider buying interest if right proposition. Address: Box 528, The FOUNDRY, Cleveland 13, Ohio.

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First class mechanic, also trouble shooter in foundry. Thirty years' experience in patterns, wood and metal and foundry work. Address: Box 515, The FOUNDRY, Cleveland 13, Ohio.

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Fourteen years' experience in all phases of foundry work, supervision and management in both production and jobbing plants. An engineering graduate well qualified to give best results in any foundry assignment, steel and high alloy. Presently employed but desires more progressive employer. Address: Box 401, The FOUNDRY, Cleveland 13, Ohio.

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Age 42, over twenty years' gray iron foundry experience. Ten years' general supervision of sandslinger production molding, cupola and sand. References. Address: Box 549, The FOUNDRY, Cleveland 13, Ohio.

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Metallurgist, graduate in Mining and Metallurgy with 25 years' experience in red and yellow brass, cupola and electric cast iron, duplex malleable and acid electric steel, well known, is interested in sales promotion or sales engineering.

Have wide foundry experience in all its phases and contacts among foundrymen which will be helpful in either product, process or material, sales promotion or sales engineering.

BOX 533
THE FOUNDRY CLEVELAND 13, OHIO

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Metallurgical Engineer 1939, M.S. 1947. Age 33, married. Melting supervision and metallurgical experience involving cupolas, converters, electric furnaces and open hearths in steel and iron foundries. Supervision of metallurgical, chemical, physical and sand laboratories. Versed in scrap reduction through quality control and standardization of molding, core making and melting. Address: Box 545, The FOUNDRY, Cleveland 13, Ohio.

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Estimating of casting weights furnished by return mail. Accurate, reliable and confidential service. Nominal fee. Send blueprints to: CHARLES E. ROLAND, 215 FOREST DRIVE, ITASCA, ILL.

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FOUNDRY ENGINEER
OR
ASSISTANT EXECUTIVE

Engineering degree—Illinois Engineering license. Five years' general foundry experience covering mechanization programs, foundry maintenance, plant layout, melting and metallurgy. 2½ years' naval engineer. Married, age 29. Desire responsible permanent position with future opportunities. Address: Box 517, The FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

B.S. degree, good practical steelmaking experience in acid electric. Experienced in sand testing and radiography and laboratory work. Also experienced in melting of grey iron in the electric furnace and in the cupola with a good knowledge of cupola operation. Now employed but desire position with better opportunity. Prefer midwest, but location is of secondary importance. Address: Box 465, The FOUNDRY, Cleveland 13, Ohio.

SAND TECHNICIAN
AND
FOUNDRY FOREMAN

Desires work in new location. Familiar with both round and angular grain sands. 25 years in steel, grey iron and malleable, both jobbing and production. Can furnish references from present employer. Available immediately. Interview can be arranged. Address: Box 541, The FOUNDRY, Cleveland 13, Ohio.

FOREMAN OR SUPERINTENDENT

Desires position in gray iron foundry. Twenty-three years' experience, practical man, jobbing or production—also soil pipe and fittings. Address: Box 502, The FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY MANAGER
OR
SUPERINTENDENT

ALUMINUM AND BRASS FOUNDRYMAN, AGE 46, NOW IN FULL CHARGE OF A MEDIUM SIZE NONFERROUS FOUNDRY IN THE MIDWEST WOULD LIKE TO MAKE A CHANGE. 26 YEARS' PRACTICAL EXPERIENCE IN ALL PHASES OF BRASS AND ALUMINUM FOUNDRY OPERATION INCLUDING GATING, RIGGING, COST CONTROL AND ESTIMATING FROM BLUE PRINTS. ANY LOCATION BUT PREFER WEST COAST. ADDRESS: BOX 542, THE FOUNDRY, CLEVELAND 13, OHIO.

Open Capacity

ALUMINUM CASTINGS

Open capacity squeezer production. Matchplate and working patterns. Alloys, high tensile and high impact strength. Address: BERLIN FOUNDRY INC., BERLIN, CONN.

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

BRASS CASTINGS

Completely modern production foundry and machine shop has open capacity for light and medium brass castings. Can make excellent price on quantity runs. Address: Box 530, The FOUNDRY, Cleveland 13, Ohio.

OPEN CAPACITY

Gray iron and aluminum castings. Specialize in gas burners and thin section castings. Address: INDUSTRIAL FOUNDRY & MFG. CO., SCHOOLCRAFT, MICHIGAN.

OPEN CAPACITY

We have open capacity for gray iron castings on cope and drag, squeezer and floor molding. Inquiries appreciated. Address: THE TREATY COMPANY, GREENVILLE, OHIO.

Opportunities

PERMANENT MOLD CONSULTANT

Complete service on the phases of permanent molding from estimating on customers' prints to the building of production running molds. Experts on making molds run and setting up permanent mold foundries. Address: Box 504, The FOUNDRY, Cleveland 13, Ohio.

OPPORTUNITY

We can furnish at any point slack, fibre and tight barrels; also fibre and steel drums. Address: BUCKEYE COOPERAGE COMPANY, 3807 ORANGE AVENUE, CLEVELAND 15, OHIO.

COKE SAVINGS OF DOLLARS

per day is possible in nearly every foundry—reduction of total time of heat—resulting in quality metal. Get our report on your cupola. Semisteel is the purest—strongest—hottest metal made in cupola. Are you making it? Our system is an investment that brings returns worth many times the fee. Distance is no bar and remember you don't wade thru hundreds of pages only to learn the information has no bearing on the making of quality castings or how to keep your losses down. Advice is concise and a real treat for every man connected with the foundry. Information free.

McLAIN'S SYSTEM INC.
236 E. NORTH AVE. MILWAUKEE, WIS.

OPPORTUNITY

We have a foundry and machine shop equipped for smaller type work in quantities. We are looking for a small or medium type machine to manufacture, engineer and sell. Address: Box 551, The FOUNDRY, Cleveland 13, Ohio.

Manufacturer's Agents

MANUFACTURERS' AGENTS

Nonferrous plaster mold foundry established in 1937 desires manufacturer's agents on commission basis to cover territories in New York, Pennsylvania and Ohio. When replying please state present lines carried and firms represented. Address: Box 525, The FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

MANUFACTURING PLANT
OHIO CITY

Sales $374,000 year, can increase. Manufacture own products, sheet metal gray iron casting and pneumatic tools. Miscellaneous items sold through dealers to AAA-1 accounts months backlog. Employ 70, fully equipped plant, foundry machine shop, forging dept. 4 buildings, 55,000 sq. ft. Quick assets $100,000. Sell with property approximate book value—rare opportunity.

APPLE COMPANY
BROKERS EST. 1905 CLEVELAND, OHIO

SMALL GRAY IRON FOUNDRY

Near Canton, Ohio. 24" cupola, 4 squeezers, rollover, pattern draw, core blowers, wheelabrator, pig and scrap. Address: Box 420, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE OR LEASE

Gray iron foundry located near Providence, Rhode Island and Boston, Massachusetts is now available. Completely equipped for immediate operation. Its equipment includes two American Wheelabrators 36" x 42", Louden overhead pouring system, wood working shop, etc. Foundry has railroad siding and is capable of melting from 20 to 40 ton daily.

BOX 537
The FOUNDRY CLEVELAND 13, OHIO

FOR SALE OR LEASE

Fully equipped brass and aluminum foundry now operating. Old age and bad health reason for selling. Address: Box 523, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Cast iron soil pipe and fitting foundry. Manufacturing 2", 3" and 4" pipe and fittings. Capacity 200 tons finished castings per month. Excellent scrap source. 100 miles from Los Angeles. Full price—$45,000.00 Would consider rental or percentage operation. Address: TAFT ALLOY STEEL COMPANY, BIN XX, TAFT, CALIFORNIA.

RARE OPPORTUNITY

Produce gray iron castings at lowest cost to meet today's competition. Ideal setup-modern nonunion small town foundry near industrial centers. Owner retiring. Liberal terms. Address: HURJA, 105 W. MONROE, CHICAGO 3, ILL.

SMALL GRAY IRON FOUNDRY

Fifteen molders—22,000 sq. ft. Good building—steel and brick—all equipment for full operation. Exceptional bargain. Location, Ironton, Ohio. Address: Box 520, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Foundries For Sale

FOR SALE OR LEASE

Small gray iron foundry; 4000 square feet floor space; 27" cupola. Good labor conditions, good location and well equipped. Address: WAUPACA FOUNDRY, WAUPACA, WISCONSIN.

Wanted-To-Buy

GRAY IRON FOUNDRY

Western New York, Eastern Pennsylvania or Northern Illinois. Approximately 6000 sq ft. floor space, pouring 2 to 4 tons daily. Address: Box 531, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Pridmore drop pattern stripping plate molding machines. Advise sizes available. Address: HARRY C. WEISKITTEL CO., INC., 4901 PULASKI HIGHWAY, BALTIMORE 24, MD.

WANTED
BRINELL MACHINE
DIRECT READING

For production testing of small to medium gray iron castings.

CENTURY FOUNDRY
3711 MARKET ST. ST. LOUIS 10, MO.

PATTERNSHOP

Interested in buying patternshop or part interest. Experienced patternmaker in wood and metal, matchplate and precision casting. Can make shop pay profit. Address: Box 472, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Pittsburgh Lectromelt type R or S electric melting furnace or the equivalent. Address: KEOKUK STEEL CASTING CO., KEOKUK, IOWA.

WANTED

Cast iron floor or cesspool drains and valve boxes. Address: Box 513, The FOUNDRY, Cleveland 13, Ohio.

WANTED
PIPE FITTING PATTERNS

We are going into the pipe fitting casting business and are interested in buying pipe fitting patterns of any type or kind. Address: Box 488, The FOUNDRY, Cleveland 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

MOLDING MACHINE WANTED

Rollover type 1500# capacity—to suit flask 30" diam 25" high—20" draw. Address: Box 451, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Square rumbler for tumbling pipe specials. Will have to be about 48 inches. Address: THOMPSON FOUNDRY & MACHINE COMPANY, BOX 295, THOMASVILLE, GEORGIA.

Accounts Wanted

INDUSTRIAL SALES REPRESENTATION

Throughout Western Pennsylvania, West Virginia and Eastern Ohio offered to reliable manufacturers, including castings and forgings. Our salesmen are efficient, aggressive and fully cover territory outlined. Address: Box 455, The FOUNDRY, Cleveland 13, Ohio.

Pattern Work Wanted

Modern pattern shop, Cleveland area. Can take wood and metal first class work. Let us quote from your prints. Address: Box 516, The FOUNDRY, Cleveland 13, Ohio.

Contract Work Wanted

Thirty years specializing in moving brick, core and mold ovens to new sites. Remodeling and repairing, combustion chambers rebuilt and modernized.

H. WESTHEAD & SON
5383 SUMMIT RD. CLEVELAND 24, OHIO

Employment Service

SALARIED POSITIONS
$3,500—$35,000

If you are considering a new connection communicate with the undersigned. We offer the original personal employment service (39 years recognized standing and reputation). The procedure, of highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details.

R. W. BIXBY, INC.
101 DUN BLDG. BUFFALO 2, N. Y.

SALARIED PERSONNEL

$3,000—$25,000. This reliable service, established 1927, conducts confidential negotiations for high-grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

OPPORTUNITIES

We are frequently asked to furnish the names of qualified managers, superintendents, metallurgists, time study men, foremen and other supervisory foundry personnel. Positions are in gray iron, malleable, nonferrous and steel foundries. Our files are being revised and application forms will be forwarded upon request. No charge for placement. Address: Box 522, The FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

10—Osborn Sq. Molding Machines
16 x 20 Table, 15" Squeeze Cylinder Head swings clear of table
1—Dust Hood & Skip Hoist for Beardsley and Piper #60 Speedmuller
1—50 Ton W & W Hyd. Bulldozer
1—36 x 86 x 36 Diamond Face Grinder
1—4' x 5' Heavy Duty Flotex Shakeout
6—30" x 40"—2000 lb. Cap. Flotex Shakeouts
Several 5° Adams Wood Slip Flasks—And Grey Iron Jackets
Various Sizes
All of the above very little used
1—O. & S. Locomotive Crane

THE OLIVER CORPORATION
533 S. CHAPIN
SOUTH BEND, INDIANA

For Sale

EQUIPMENT FOR SALE

MOLDING MACHINES
3—75J Osborn Jolt Squeeze.
2—SPO #611-B Stationary, Oscillating, Jolt, Squeeze Strippers
1—SPO #4½ JHS Air Jolt Hand Strip
3—Mumford 3" Cyl. Core Jolt, with 20" x 15" Table
4—Osborn #36 core box drawing machines.

BLOWERS FOR CUPOLAS AND FURNACES
2—Spencer Turbine Cupola blowers 4100 CFM 16-oz, 25 HP direct connected motor
Maxon-Premix Blowers for Gas, ¼ to 1 H.P.

METAL MELTING EQUIPMENT
1—Hausfeld 2000# Aluminum Capacity Furnaces. Barrel Type, Open Flame, Oil Fired
2—Monarch-Rockwell Rotating, 500# Brass, Oil New 32" to 41" Dia. Shell Cupolas made to order.
1—Buckeye #150 crucible filling furnace, with premix blower for gas fire

TUMBLING MILLS AND SAND BLAST
1—Pangborn style GJ-1 rotoblast barrel, complete with Pangborn style FM automatic loader. Load capacity approximately 16 cu ft.
2—Pangborn No. 2 GH direct pressure type sandblast barrels, motor driven. Complete units.
1—Pangborn LE 6 ft. sandblast table, continuous sand feed, motor driven. Complete unit.
1—Pangborn LE 4 ft. sandblast table, continuous sand feed, motor driven. Complete unit.
1—Pangborn Sand Blast Unit including generating tank, shot cleaner, bucket elevator. Suitable for use with room.
1—Pangborn type EN-2 sand blast cabinet, suction type, 5 x 3 x 7 high.

MISCELLANEOUS
2—Ingersoll-Rand size LC-7 Air Hoists, 700# capacity.
1—Gardner-Denver air compressor complete with 5 HP 3/60/220 motor and controls.
4—Heavy duty flexible shaft grinders 2 HP.
1—Heavy Duty Back Geared Sprue Cutter, 1½" square knives, T & L Pulley Drive.
1—Fay & Egan 14" blade revolving, double arbor, tilting table, variety saw with roller table.
1—Young Bros. Co. tower core oven, 5' x 1' shelves, gas fired, complete with Foxboro Control.
1—Young Bros. Co. batch type recirculating hot air gas fired core oven, 5' x 6' door opening, 9' deep.
3—Foundry Equipment Co. sliding shelf core ovens with five 30 x 42" shelves, 8" high. Gas Fired.
1—Lampson Endless Mold Conveyor 100' long x 16' wide, with 19 x 26" pallets, 36 inches on centers.
2—Warner material elevators 1000# capacity, 20' lift, 2' x 2' two tier cab.

CLIFTON MACHINERY CO.
1023 W. 6th ST. CINCINNATI 3, OHIO
PHONE PARKWAY 7812

FOR SALE
SAND HANDLING SYSTEM

19 individual moulders' hoppers, two 25 ton sand storage bins, one #50 Beardsley & Piper speed muller with 40 HP motor, magnetic separator with bucket elevator, overhead monorail system and cab controlled electric hoist and monotractor and shell buckets with automatic trips for delivering sand from speed muller to moulders' hoppers.

OLD COLONY FOUNDRY COMPANY
EAST BRIDGEWATER MASSACHUSETTS

FOR SALE

HARVILL HD-102 die casting machine. 400 shots 6.37# aluminum large fisher furnace hoist. Virtually new. Used few times. Bargain quick sale. Address: J. E. HIGGINS, 3109 PEACHTREE DR. NE., ATLANTA, GA.

FOR SALE

Used Universal tensile testing machine. Good condition. Type MP-10, motor driven, hydraulically operated. Price $2,000.00. Address: MIDWEST FOUNDRY INC., 1534 SOUTH MEAD, WICHITA, KANSAS.

Classified Advertising

For Sale

FOR SALE

Steel Flasks:

Sets	Size	Drag	Cope	Price ea.
9	11"x18"	3½"	4"	$4.00
21	10"x18"	3½"	4"	4.00
22	28"x48"	7"	7"	30.00
15	35"x41"	18"	12"	40.00
3	39"x58"	12"	12"	40.00
1	54"x54"	20"	6"	40.00
2	57"x57"	6"	6"	40.00

* All steel welded construction, with steel bars in cope

25	18"x42" (cannon type)	5"	9"	35.00

Popoff Flasks:

1 14"x16" Fremont 4" drag 4" cope with 30 iron jackets
1 12"x20" Fremont 4" drag 4" cope with 30 iron jackets
1 12"x18" Adams 4" drag 4" cope with 29 alum. jackets
1 12"x12" Hines
1 12"x16" Hines

(Prices: Flasks $30.00 each Jackets $4.00 ea.)

Snap Flasks:

10 12"x16" Rothacker 4" drag 4" cope—800 steel bands
2 12"x18" Rothacker 4" drag 4" cope—500 steel bands
1 13"x22" Rothacker 4" drag 4" cope— 50 steel bands

74 14"x18" Steel bands
95 14"x18" Steel bands

(Prices: Flasks $15.00 ea. Bands .40 ea.)

3 #91 Osborn Core Blowing Machines—A1 condition each $400.00
1 #404 Clearfield Sand Mixer 4 cu. ft. capacity—like new $800.00

1 Pangborn Rotoblast Cleaning Machine 7 cu. ft. capacity like new with Dust Collector complete $2600.00

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.
15019 SARANAC RD., CLEVELAND 10, OHIO
TELEPHONE: GLENVILLE 1222 AND 1538

FOR SALE

CUPOLA CHARGER

2 ton P & H monorail unit, cab operated, 30' lift, 2 motors 3-60-220-440. This outfit complete with charging bucket and 79' of all steel crane way.

UNIVERSAL ENTERPRISES, INC.

P.O. BOX 5033 PHONE Y 1894 TAMPA, FLA.

FOR SALE

SAND MIXER

Model 920 Clearfield, 9' dia., 20 to 25 Cu. Ft. capacity with No. 3 bucket type loader and electrical equipment Serial No. 193C, new in 1941.

TUMBLERS

7 and 14 Cu. Ft. Pangborn "Rotoblast" barrels each with hopper, dust collector and electrical equipment. New in 1942 and 1943.
Globe and Hartford octagonal barrels.

MOLDING MACHINE

No. 193-4 Milwaukee jolt, squeeze, strip. Serial No. 11794, new in 1942.

FURNACES

No. 690 M Campbell Hausfeld tilting type for brass or aluminum. Gas fired.
4—No. 80, type S, Fisher pit type for brass or aluminum. New about 1941 or 1942.

BLOWERS

Many sizes of pressure blowers and exhausters. Send your inquiry.

MILES MACHINERY CO.
SAGINAW, MICH.

FOR SALE

VIBRATING SCREEN — Tyler - Niagara Type #300. Serial #8733". Size—72" x 48". V-belted motor drive. Complete with gear reducers, sheaves, and Jeffrey Belt Conveyor Bucket Type Elevator.

SAND MIXER OR MULLER—Clearfield #610. Serial #225-C. NEW IN 1944. 72" dia. pan. Capacity for charge—10-14 cu. ft. Motor driven w/15 h.p. 220/440 volts motor. Complete with motor driven hoist.

JOLT SQUEEZE PATTERN DRAW MOLDING MACHINES—Johnson & Jennings. NEW IN 1943. Table size—15" x 21". Head Platen size—12" x 8".

HAND ROLLOVER POWER DRAW MOLDING MACHINE—SPO. Complete with run out car. Size inside frame—22½" x 72".

#6T Ransome Tailstock, 16,000# capacity. Faceplate size 53" x 53". Distance floor to spindle center—49". Two available—like new.

VENTILATING FANS, 36" floor and wall models. 220 volts.

FALK MILL SUPPLY CO., INC.
18 WARD ST.
ROCHESTER 5, N. Y.

LIST OF EQUIPMENT FOR SALE

16—J-275 Osborn Jolt Squeezers.
1—Model "AA" Sand Cutter.
1—Schramm Air Compressor, direct drive, 20 H. motor.
4—JDP Jolt Strippers.
5—"G" International 20 x 8 Rollover Machines.
4—Beardsley & Piper Screenarators.
1—Jeffrey Screenarator.
1—"B" Royer.
1—Swing Grinder, 5 H. Motor.
2—No. 1 Demmler core blowers.
2—No. 2 Demmler core blowers.
1—American Wheelabrator 40 x 40 barrel.
2—Grinding Stands with 3 H. motor, V-belt drive, mounted on back of grinder, made by Hammond Machine Co.
1—#30 Beardsley & Piper Speedmuller with loading bucket and all motors and switches.
1—Blower—North American make, direct drive, G. & E. 5 HP. motor, 575 C.F.Ms., 20 oz. pressure.
1—Federal Electric Riddle.
4—Combs Electric Riddles.
3—Flexible Jarvis Grinders.
2—Practically new, Timken Roller Bearing Ladles, made by Modern Equipment Co., Ladle Bowl 40 x 42.
1—Small Timken Roller Bearing Ladle, made by same company, 800 lb. capacity.
1—Lot of Ferro Silicon)
1—Lot of Ferro Manganese) This is crushed
1—Lot of Chrome) material.
15—50 lb. sacks of Ferro Silica.
3—Shakeout Vibrators.
1—24 x 42 tumbling mill—inside measurements
2—36 x 60 tumbling mills each one equipped with speed reducer and motor.
1—American sand cutter, electric driven, 52" cutting reel, 62" between wheels.
1—Tag No. 250 Rollover "G" Machine 20 x 8.
1—International Rollover Machine, 20 x 8".
2—International Rollover Machines 20 x 8".
1—HJ-International 16 x 4 Power Jolt and Hand Roll Foot Draw.
1—International Rollover Machine 30 x 12.
1—Johnson & Jennings 24" x 30" table, 10" Draw, Power Jolt, Power Roll and Power Squeeze.
1—Osborn Jolt Stripper 24" x 30" Table.
1—Osborn Jolt Pin Lift Machine 24 x 30 Table.
1—Tag No. 250 Power Jolt Hand Lift Machine.
7—Osborns.
3—"G" Machines, 10" x 24" Table.
1—Pin Lift Machine, Tag No. 190, 22 x 24.
1—"R" Type Hand Rollover Machine, 24".
4—Boxes Core Plates—8 x 30.
4—Riddle Tops.
2—Electric Riddles.
2—Air Hoists.
1—R-Type International Machine.
1—Lot of Air Hose.
3—Core Blowers.
1—Wheelabrator, loader and elevator for Wheelabrator.
2—Ingersoll Rand Air Hoists.
2—Osborns, 12" Jolt Squeezers, #208 and 210.
1—Jeffrey Sand Conditioner No. 203.
1—Osborn, Serial No. 11501A, Tag No. 157.
2—Osborns, 10" Jolt Squeezer.
1—Hermit Tag 183.
2—Sections Roller Conveyor.
500—Core plates—all sizes.
1—36" band saw with 5 H. motor.
And many other articles too numerous to mention.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST. KALAMAZOO 52, MICH.

Classified Advertising

For Sale

FOR SALE

Porbeck mold dryer
Rock type core buster
Ten air rammers
Two 10-gallon blow torches
Three mold sprayers
Assortment of gaggers, clamps, and rigging
Sterling steel flasks
Square flasks, cast iron
Round flasks, cast iron
Demmler Core Blower Machine
Tabor—Bump and Rollover Machine
Milwaukee—Snap Mold Machine
Wadsworth—Core Cutting Machine
Armstrong Blum—Rod Cutting Machine
American—Rod Straightener and Shear
Clearfield Sand Muller
Simpson Muller
Enterprise Oil Burning Oven
Master Hi-Speed Mixer
Truckman Gasoline Operated Lift Truck
Coleman Oven
Two Motor Driven Sand Screenerators
Racks—Eight large ones for baking cores
Foundry Rigging
One Sandblast Machine — American — Foundry Equipment
One Standard Elec. Snagging Grinder
Grinding wheels
Pneumatic Chipping Hammers
Core Breakers

BOX 518
The FOUNDRY CLEVELAND 13, OHIO

FOR SALE

TURBO BLOWERS (3 Phase, 60 Cycle)

cfm	Pressure	Make	Motor H.P.	Volts	Speed
3500	40 oz.	Spencer	60	440	1800
2200	40 oz.	Spencer	40	220/440	3600
1400	16 oz.	Spencer		220/440	3600
1050	32 oz.	Spencer	15	550	3500
900	24	Spencer	15	220/440	1800
650	32	Spencer	10	220/440	3600
225	10	Spencer	1	220/440	3600
150	3 lbs.	Spencer	5	220/440	3600

PRESSURE BLOWERS (3 Phase, 60 Cycle)

2500	7 oz.	Sturtevant	15	220/440	1800
2400	14 oz.	Mahr	15	220/440	3480
1400	8 oz.	Robinson	5	220/440	3600
1150	20 oz.	Nth. Amer.	10	220/440	3600
950	16 oz.	Nth. Amer.	7½	220/440	3600
660	20 oz.	A & B	7½	440	3600
550	20 oz.	A & B	5	440	3600
450	6 lbs.	A & B	30	220/440	3450
340	20 oz.	A & B	3	440	3600
250	12 oz.	Gen. Elec.	2	220/440	3600
150	12 oz.	Nth. Amer.	1	220	3600
150		McKee	1	440	3600

MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND, OHIO

FOR SALE

FOR SALE

Molding Machines
#602 Osborn rollover—1943
#442 Osborn rockover—1945
#559 Osborn stripper—1945
(2) #4 Sly Blast Mills
4800 CFM Parsons Dust Collector
30' Coleman Tower Core Oven
1 ton Air Hoist
#3D Gardner Buffing Machine—1944
10 H.P. Tabor cutoff machine
(2) Bench type core blowers
1 Late Model tractor type sandslinger
No reasonable offer refused.
We invite your inquiries on all foundry equipment and machine tools.

BALCHER MACHINERY SALES
1884 S. COMPTON ROAD
CLEVELAND HEIGHTS 18, OHIO

FOR SALE

5 SPECIALS

2 Norton Type C Cylinder Grinders, 10 x 18, 15 h.p., 220-440, feed 500-1800.
Cincinnati Hydraulic Cylinder Grinder, 6 x 18, 10 h.p., Model EA '38.
Milwaukee 143-9 Jolt Squeeze Strip Machine, nearly new.
GE Compressor, 100 c.f.m., high pressure, 35 h.p., direct drive.
All excellent condition, priced for quick sale.

JAY SALTER
306 ROSEDALE ST., ROCHESTER 7, N. Y.

For Sale

GENERAL ELECTRIC X-RAY UNIT
ONE MILLION VOLT

WALTER H. MEYER
MACHINERY & EQUIPMENT CO.
605 W. WASHINGTON BLVD.
CHICAGO 6, ILL.

WHEELABRATOR TUMBLAST
42 X 48 WITH LOADER
WALTER H. MEYER

MACHINERY & EQUIPMENT CO.
605 W. WASHINGTON BLVD.
CHICAGO 6, ILL.

FOR SALE

1—Cupola #3½ model B section D and shelf segments. 1—Spencer Turbo centrifugal type blower 30,000 CFM, 16 oz. 20 HP motor connected. New and ready immediate shipment.

ENTERPRISE FOUNDRY INC.
817 So. BROADWAY OKLAHOMA CITY, OKLA

FOR SALE

All or any parts of complete foundry equipment for making cast iron welding rod. Includes Whiting cupola, muller, bins, elevator, conveyor, roller conveyor sections, 2 jolt squeezers, patterns, flasks and miscellaneous items.

BOX 535
The FOUNDRY CLEVELAND 13, OHIO

FOR SALE

2—Stroman Furnaces
1—220/225
1—250/275
complete with blowers, piping and electrical equipment.
1—Demmler #1 core blower

BRONX BRASS FOUNDRY
2727 Bailey Ave. Bronx 63, N. Y.

FOR SALE

1—Pangborn model 2 G D1 sand blast machine with dust collector
1—Tabor abrasive cut-off machine
1—Young Bros. electric core oven
2—Fisher #500 type AMM gas fired tilting aluminum melting furnaces complete with turbo compressors
1—Housfeld—250# oil fixed tilting melting furnace
1—Fisher—400# oil fixed tilting melting furnace
1—Sutton gas fired sand drying stove

THE PARKER APPLIANCE CO.—
PURCHASING DEPT.
17325—EUCLID AVE.
CLEVELAND 12, OHIO

FOR SALE

1—Oliver No. 103 Pattern Milling Machine, for wood and metal, complete with 5 HP., 3 phase, 60 cycle, 440 volt motor directly on the arm and a ¾ HP motor for the power hoist, together with other regular equipment, also with the following additional items:

1—732 special gauge for setting knives
1—640 cutter head, left hand
1—724 ideal universal cutter vise
1—Cabinet complete with blades

(All in excellent condition, having been used only a short time)

CARVER PUMP COMPANY
MUSCATINE, IOWA

For Sale

FOR SALE
USED FOUNDRY EQUIPMENT

SANDCUTTER: American, model 96/61, 96" overall width, 61" cutting blade, gasoline powered, new engine.
AIR COMPRESSORS: 2—Chicago Pneumatic vertical, class PB4, 225 CFM at 100 lbs., with or without motors and controls.
CUPOLA BLOWER MOTOR: GE., No. 1003135, type 1-2-75/900, 3600 RPM, form "K", 60 cy., 75/95 H.P., 121/212 amp., with 220 volt autotransformer reduced voltage starter & overload relay.
SPRUE CUTTER: Milwaukee, will cut 3 sq. in. of steel.
ROTOBLAST: Pangborn, GK-21, 48" x 54" barrel, "FNI" skiphoist loader, motor drive and controls 220 volt, 60 cy., 3 ph., & dust separating box.
MOLDING MACHINES: 12 Arcades, power jolt squeeze, Model #81, 8½" squeeze cylinder, 3" jolt cylinder, 2-model #91, 10" squeeze cylinder, 4" jolt cylinder. International and Milwaukee, 10" and 12".
TROLLEYs 4 wheel "I" beam, 4,000 lb. cap.
AIR HOIST: Ingersoll-Rand, 4,000 lb. cap.
JACK LIFT TRUCK: Yale, 5,000 lb. cap., Model YSW1142.
ELECTRIC WELDER: Lincoln, 40 H.P., 1200 RPM, 220 volt, No. A5033.
TRANSFORMER: Electric Furnace Co., 40 KVA, 60 cy., 13200 volts primary, 3 ph., 60 cy., high and low tap.
SCALE: Howe weightograph, 60" x 70" platform, 5000 lb. cap.

GREDE FOUNDRIES, INC.
1320 S. FIRST STREET, MILWAUKEE 1, WIS.
TELEPHONE: MITCHELL 5-2450

FOR SALE

331 Osborn jolt rollover squeeze pattern draw molding machine. Two years old, in good condition. Can be seen in operation. Priced right for immediate sale.

BOX 548
THE FOUNDRY CLEVELAND 13, OHIO

FOR SALE

Two (2) side door charge Heroult electric arc furnaces including shell, roof, mast, winch motor assembly, electrode assembly, tilting mechanism, tilt control panel stand, one GE furnace control panel, one set flexible secondary leads. No transformers.

One (1) Ajax 50 pound induction furnace, complete with control panel and required capacitors. No motor-generator nor bus bars are included. In excellent condition.

BOX 416
THE FOUNDRY CLEVELAND 13, OHIO

FOR SALE

12—OSBORN ROLLOVER JOLT MOULDING MACHINES.
Stationary, model 2047-1. Flask space 22½" x 21½" draw 11½".
These machines are like new and are priced for a quick sale at $175.00 each. Original cost $2400.00 each, weight 3500 lbs. each.

CANTON INDUSTRIAL SALVAGE CO.
325 ELEVENTH ST. S.E. CANTON, OHIO

FOR SALE
FOUNDRY EQUIPMENT

1—Osborne Core Blower, No. 193
1—Demmler Core Blower, Style 3-E
1—Osborne Core Box Drawing Machine #146
Molding Machines—Herman R.O. 1500 lb. cap.
International 24" x 30" Type G
Osborne Jolt Squeezers, various sizes
3—2-ton Ingersoll Air Hoists

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO., NOT INC.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

Classified Advertising

For Sale

FOR SALE

1 Small Rattler 24" x 48"
1 Garden City #2 Blower
1 Connersville Blower 10 Cu. Ft. Displacement Per Revolution
2 Whiting 2000# Geared Ladle
2 Modern 1500# Geared Ladle 2 Yr. Old
1 Cyclone 3 Ton Chain Falls
1 Cyclone 8 Ton Chain Falls
1 Peerless 2 Ton Chain Falls
1 Whiting #3½ Cupola
1 McLeod Hose Type Sand Blast

PEERLESS FOUNDRY CO.
INDIANAPOLIS 7, IND.
PHONE—IMPERIAL 3431

NEVER USED—WILL SACRIFICE

One molding machine #559 jolt stripper made by Osborn Mfg. Co. One molding machine #442 jolt rockover pattern draw made by Osborn Mfg. Co.

THE ENTERPRISE MFG. CO. OF PA.
3rd & DAUPHIN STREETS
PHILADELPHIA 33, PA.

FOR SALE

Complete pattern equipment for malleable pipe fittings, sizes ⅜" to 2", or will cooperate with a foundry to produce. Address: LAKESIDE FOUNDRY, WARSAW, INDIANA.

For Sale

EQUIPMENT FOR SALE

3—30" x 72" and x 96" long
3—48" x 72" and x 84" long

Whiting tumbling barrels—belt driven. Complete in every respect.

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ST. JOHNSBURY, VERMONT

FOR SALE

4 Osborn 276-J Squeezers
8 Tabor 10" Stationary Jar Top Squeezers
1 Lindberg Heat Treating Furnace Type 2828-EH
1 Osborn 275-J Squeezer
1 American Wheelabrator Multi Tablast Model BM#66200, Serial #A50689
1 Despatch Core Oven, Style L4860, Gas Type
2 Tannewitz Band Saws with 36" Wheels
1 Tannewitz Band Saw with 42" wheel
1 Schramm 4 cylinder air compressor with 25 HP motor
1 Eclipse Tilting Furnace equipped for gas firing and takes 400 lb. crucible
3 500 lb. oil fired stationary aluminum melting and holding furnaces
2 Tabor Jar-Ram, Hand Rollover, Hand Draw moulding machines
1 Tabor Portable Jar Flask Lift Moulding Machine
1 Tabor Portable, Shockless-Jar Flask Lift Moulding Machine
1 Osborn 712-J Jolt Squeeze Stripper

OLD COLONY FOUNDRY COMPANY
EAST BRIDGEWATER, MASSACHUSETTS

For Sale

SURPLUS EQUIPMENT

1—CHAMPION CB-400 CORE BLOWER, almost new with electrical equipment, processed and skidded for immediate shipment
1—St. REGIS 181 FV FIRE EXTINGUISHER, for magnesium, used, good condition.
6—PUMPS AND TANKS FOR VARSOL CLEANING OR COOLANT USE. Electric motor, switch and float, brand new.
ALL ABOVE AC, 3-phase, 60 cycle, 220-440 Volt
6—No. 200 LAVA CRUCIBLES
12—No. 100 LAVA CRUCIBLES

ADDRESS UNIONWORTH INC.
CENTRAL FOUNDRY BUILDING
FT. PACIFIC STREET
NEWARK, N. J.
PHONE: BIGELOW 3-4002

FOR SALE

New heavy duty motorized rod cutter, 65 cuts per minute; capacity: ⅝ inch round hot rolled steel. Brand new. $890.00 f.o.b. Cleveland. Address: The Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

FOR SALE

Sly Tumbling Barrels. Several Sizes. In good condition. Round and square. Immediately available. Address: PORTLAND STOVE FOUNDRY CO., PORTLAND, MAINE.

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4 inches	40.00	36.75	33.25	30.00
5 inches, ½ col.	48.00	44.00	40.00	36.00
6 inches	58.75	53.25	48.00	42.75
7 inches	66.00	60.00	54.00	48.00
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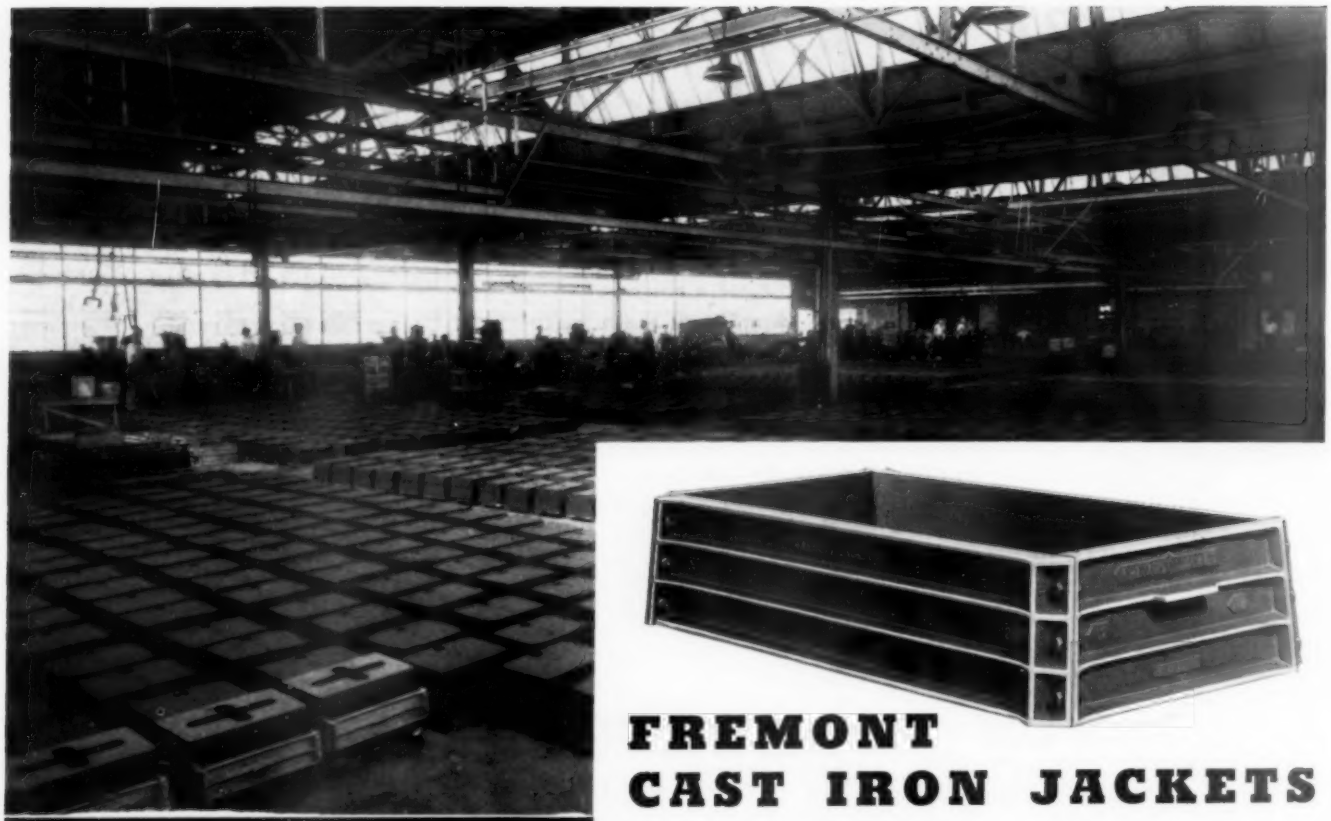

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CAST IRON JACKETS

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MAGNESIUM FLASKS

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THE FREMONT FLASK CO.
Fremont, Ohio

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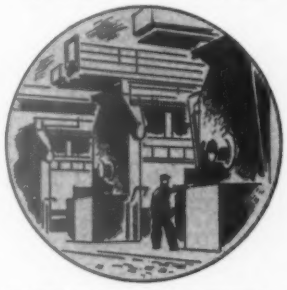

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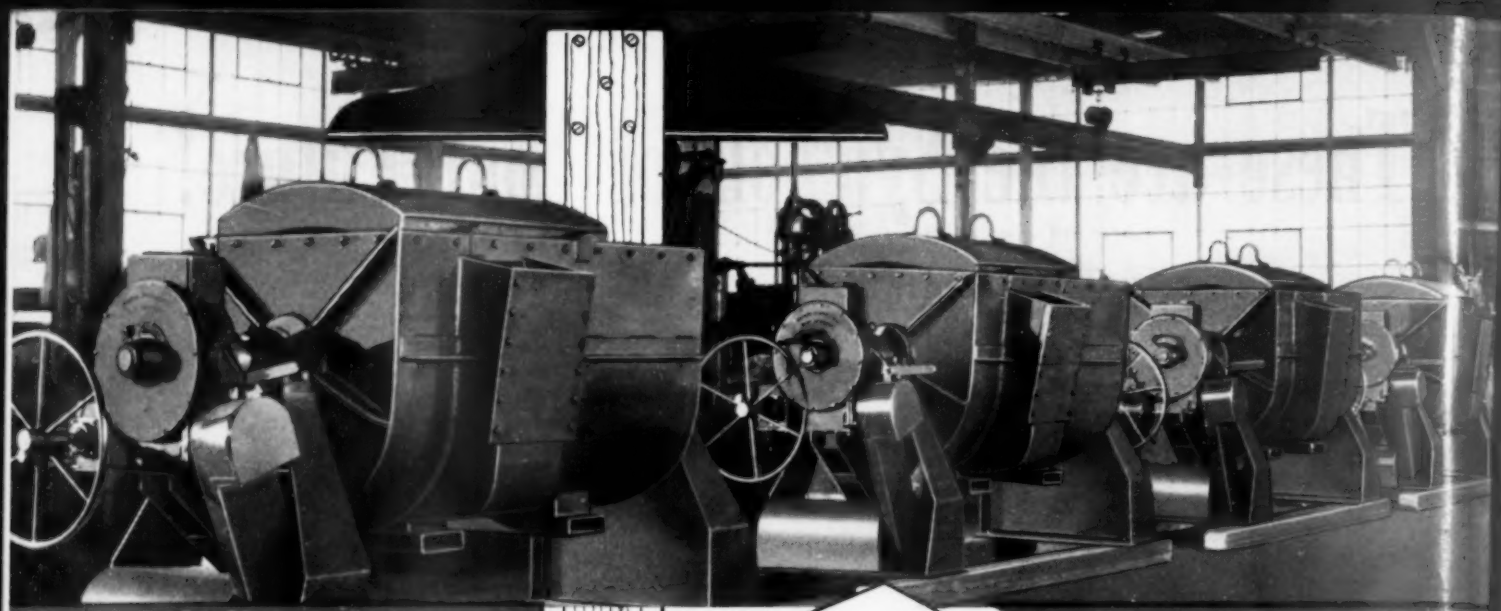

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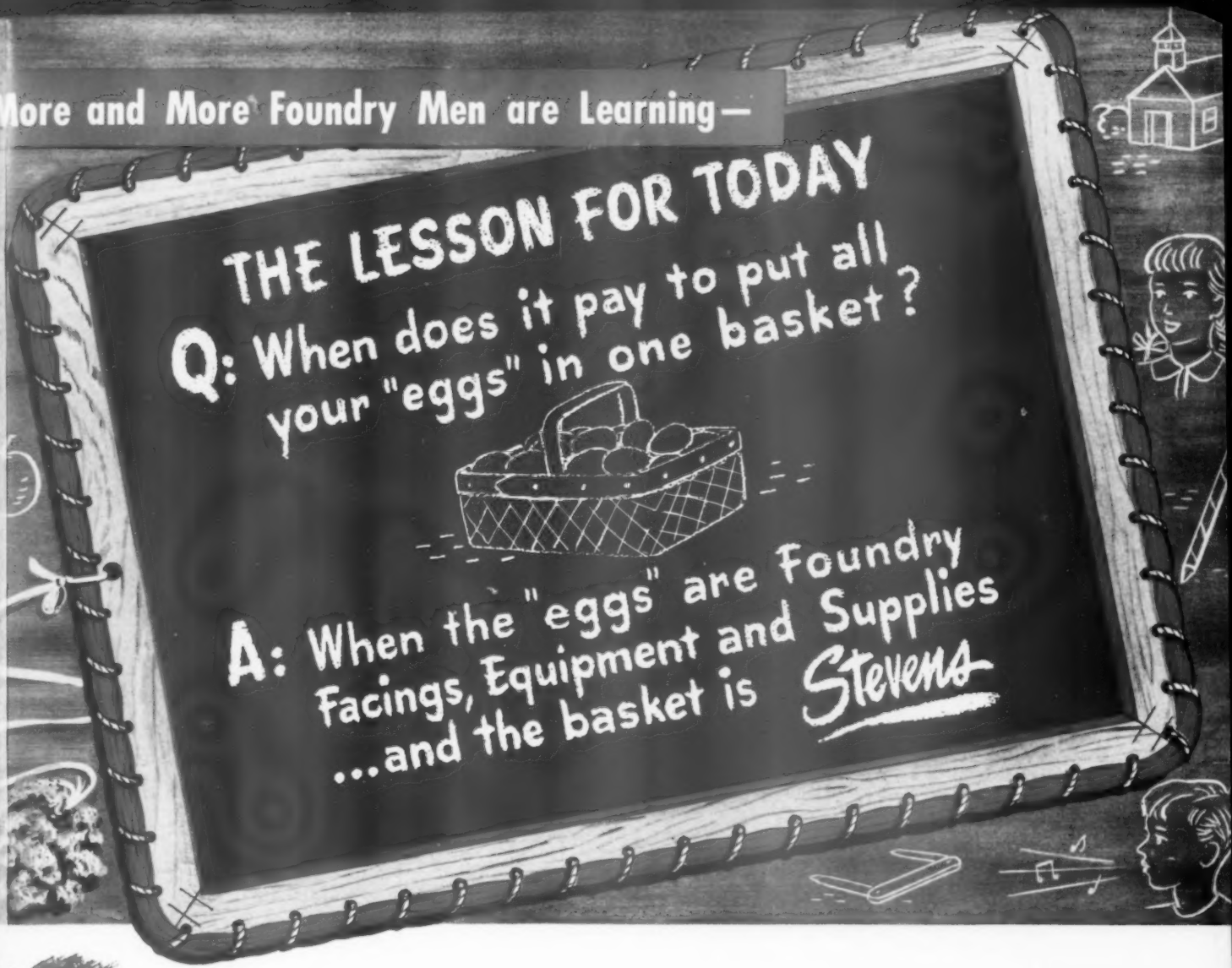
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PA Positive Action OSCILLATING Feeder-Conveyor

Another new and distinctive contribution by LINK-BELT

Already installed in a number of foundries, the new Link-Belt Oscillator for handling castings and shakeout sand, has proved its economy and high efficiency.

It cools as it conveys; evening out the surges and providing a smooth flow to shakeout screen or the system beyond. It is leak-proof, low in power consumption and maintenance — only six points to lubricate.

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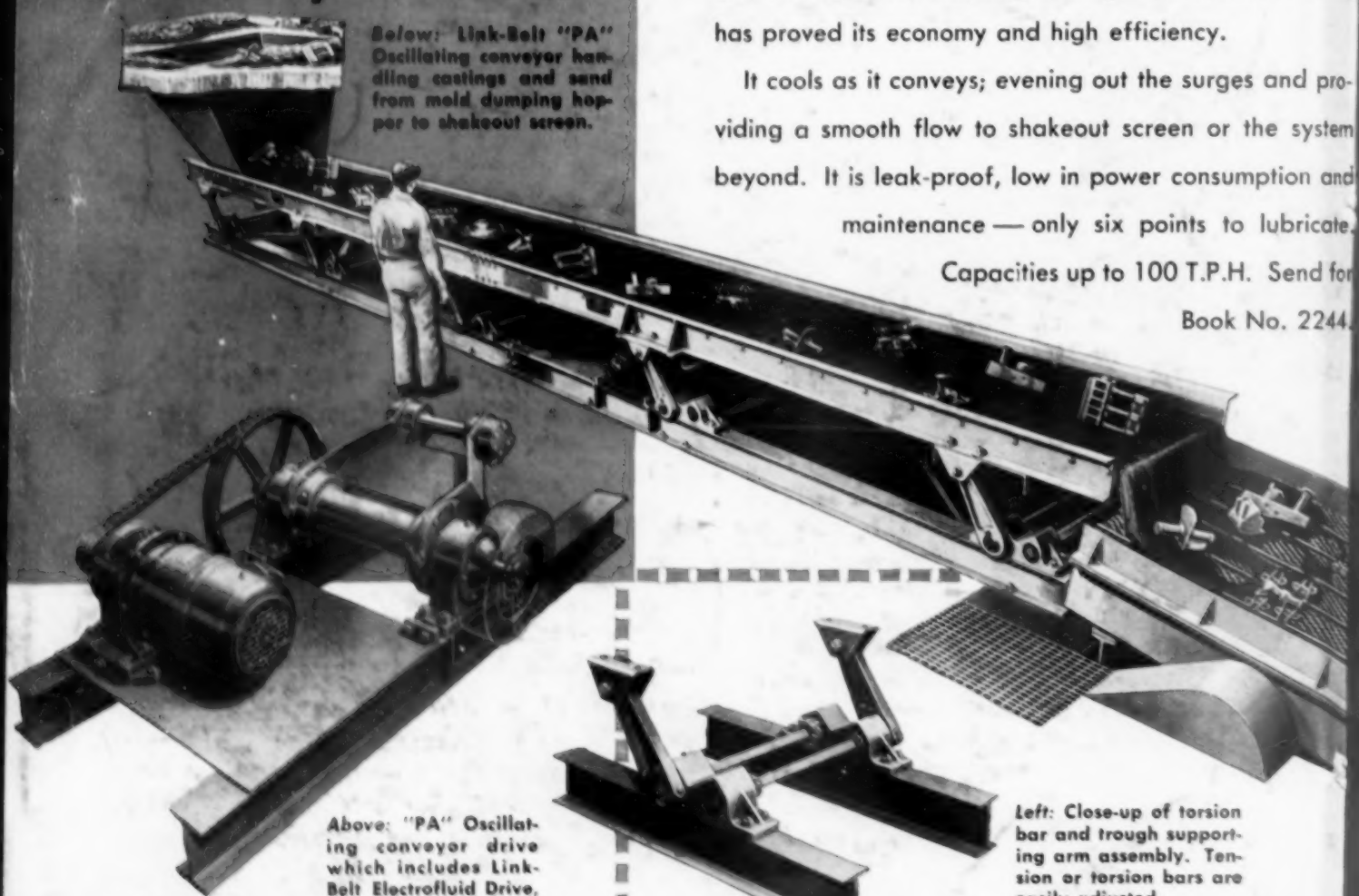
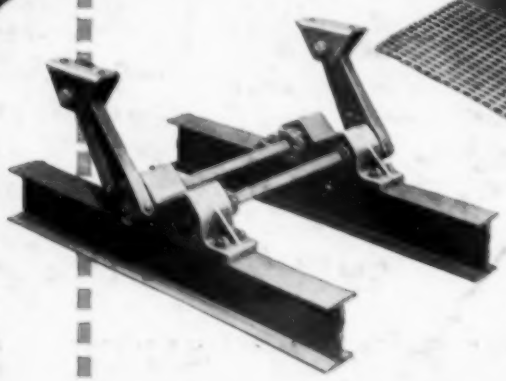


Below: Link-Belt "PA" Oscillating conveyor handling castings and sand from mold dumping hopper to shakeout screen.

Above: "PA" Oscillating conveyor drive which includes Link-Belt Electrofluid Drive, roller bearing eccentric mechanism and connecting rod assembly.



Left: Close-up of torsion bar and trough supporting arm assembly. Tension or torsion bars are easily adjusted.

11,344

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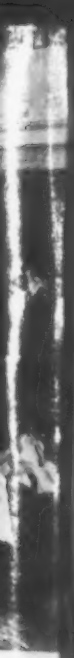

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